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This study is an analysis of the benefits and constraints associated with implementing a specialized U.S. Air Force Weapons Systems Officer (WSO) training program in Undergraduate Navigator Training (UNT). This treatise defines the potential cost savings to be achieved with specialized training at both the UNT level and subsequent operational WSO training programs. The impacts on aircrew readiness are addressed as are the personnel resource management constraints which would result from the departure from the current "universally assignable" concept of aircrew management that specialized training incurs. The research assumes the validity of the proposed program to produce more proficient WSOs and addresses the consequences involved in implementing the training program. The general conclusions of this study are that specialized training will result in decreased costs in UNT and operational training programs to bring the students to the current level of proficiency and that the potential adverse management consequences can be accomodated.

SPECIALIZED UNDERGRADUATE NAVIGATOR TRAINING FOR WEAPONS SYSTEMS OFFICERS

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements of the degree

MASTER OF MILITARY ART AND SCIENCE

by

NOLAN W. SCHMIDT, MAJ, USAF
B.S., Ball State University, 1964

Fort Leavenworth, Kansas
1978

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Specialized Undergraduate Navigator Training for Weapons Systems Officers

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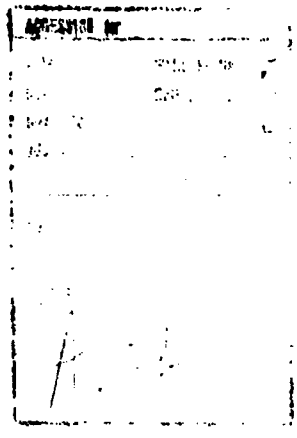
Final report 9 June 1978

A Master of Military Art and Science thesis presented to the faculty of the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027



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THESIS APPROVAL PAGE

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The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

This study is an analysis of the benefits and constraints associated with implementing Air Training Command's proposed specialized Weapons Systems Officer (WSO) training concept in the U.S. Air Force Undergraduate Navigator Training (UNT) program. The investigation defines the costs of the proposed program in both UNT and advanced courses, analyzes the impacts on aircrew readiness, and explores the personnel resource management constraints which would result from a departure from current "universally assignable" concepts of managing aircrew personnel.

The general conclusion of this study is that specialized training offers potential cost savings in training WSOs to the current minimum levels of proficiency and that these savings may be reinvested in operational training programs to increase proficiency over that achieved under the current program. Additionally, the study reveals that the potential adverse management consequences can be accommodated.

ACKNOWLEDGMENTS

The author extends his sincere thanks and appreciation to Major Joseph Bream, Research Advisor, who freely devoted many hours to assisting me in this effort. Not only were his thoughts, critiques, and suggestions invaluable in preparing this thesis, his enthusiasm and encouragement served to maintain the momentum required to complete the project.

A special thanks is extended to Dr. George Rice, Consulting Faculty, who willingly suffered through long hours of Air Force acronyms and jargon while learning aircrew training and personnel resource management processes. His direction proved essential in keeping this project "on track". Appreciation is also extended to Lieutenant Colonel Roger "Kip" Taylor and Major James Compton who provided advice and assistance in the preparation of this thesis.

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CHAPTER 1

INTRODUCTION

A headline in the August 1972 issue of Airman reads, "Navigator Training Overhauled." In the article, Ted R. Sturm, an Airman staff writer interviews Colonel J. L. Price, Jr., Chief of Training Programs Division, Headquarters, U.S. Air Force, on recent changes in navigator training. In this interview Colonel Price describes the changes that have been made in the navigator training program at Mather AFB, California and explains the need for these changes. According to Colonel Price the modifications to the training program were required because of the altered role of the navigator which was brought about by the use of navigators in fighter/bomber aircraft, the increased sophistication of the equipment used, and the increased demands placed on Weapons Systems Officers. Colonel Price states:

> ". . . the navigator's role as a Fighter Weapons Systems Officer is . . . more demanding. That's why navigator training was broadened to include training in tactical operations, basic flight instruments, missile launch, inertial systems, fighter/interceptor tactics, and other tactical subjects."[1]

In the August 1973 issue of Air Force Magazine, an article appeared entitled "UNTS, the Last Word in Navigator Training." The article describes the latest changes in navigator training and explains the concept of the Undergraduate Navigator Training System (UNTS). It also provides considerable detail on the Air Force's new navigator training aircraft, the T-43, and the Air Force's new simulator for training student navigators, the T-45. The introduction to the article reads as follows:

> "The Air Force's training of its navigators and bombardiers, impeded heretofore by World War II vintage equipment, is being brought abreast of the state of modern aeronautical and electronics technology with the introduction this year of a sophisticated new ground trainer and a modern airborne trainer capable of simulating the flight conditions aboard the Air Force's newest operational aircraft . . ."[2]

Numerous other articles in the Airman, Air Force Times, Air Force Magazine, and Navigator Magazine can be found which expound on the merits of the new approaches to navigator training and the advantages realized in the purchase of new navigator training aircraft and simulators. The attitude of the Air Staff must have been that with all this attention focused on training the navigator, surely a highly capable, better skilled, and more qualified navigator was being produced. If this presumption prevailed, it was short lived.

The 1977 Functional Management Inspection (FMI) report on Tactical Air Forces Aircrew Training conducted by the Air Force Inspection and Safety Center (AFISC) contained numerous criticisms of Undergraduate Navigator Training (UNT) as the program pertains to the training of WSOs. Though the report is classified, an unclassified "statement of fact" has been furnished by the commander of AFISC (appendix B). To quote from part II (Findings) of this report:

> "UNT graduates lack the professional skills required to be effective in the fighter crew force. Most skills taught in UNT are not used in fighter aircraft. More importantly, the psychological attitude needed to be effective in the fighter force is not sought out, nurtured, or developed in UNT or in the small portions of the fighter training programs that are devoted to navigators."[3]

This is a most exceptional castigation to be found in an official Air Force inspection report.

Additional adverse comments concerning the capability and training of WSOs are contained in the 1977 Corona Ace study conducted also by the AFISC. Though the bulk of the report is classified, unclassified

passages clearly assert that significant problems exist in the WSO's post-graduate performance.[4] To understate the situation, a problem has been surfaced!

On 11 April 1977 General John W. Roberts, Commander of Air Training Command (ATC) wrote General Robert J. Dixon, Commander of Tactical Air Command (TAC) (appendix C) concerning the training needs of the WSO:

> "As a result of preliminary findings from Corona Ace and subsequent discussions between your staff and mine, I believe our combined efforts are necessary to fully resolve the training needs of the Weapon Systems Officer (WSO)."[5]

Conferences were convened and were attended by representatives of ATC, TAC, and various offices of the Air Staff. Revised TAC and ATC training curricula were developed which were designed to provide a more capable WSO to the using commands. These proposals were forwarded to the Air Staff for review. To date, the proposals have not been approved for implementation. The primary rationale for deferring an immediate decision to implement the proposed training programs was to provide time to analyze the impacts that the revised programs would produce. The principal impact is that the proposed training program would segment navigator training into two separate programs, one for the navigator who would be trained for duty in fighter and fighter reconnaissance weapons systems, and one for the navigator who would be trained to serve as a "classic" navigator in missions such as airlift, strategic bomber, or tanker. This "dual track" concept directly impinges on the Air Force's dictum that graduates of UNT be universally assignable to any navigator function. From a rated resource management perspective, this issue is a matter of considerable significance in that when changes occur in force structures and weapons systems enter or are withdrawn from the active

inventory, or the numbers of the various types of aircraft are changed, or the ratios between aircraft to crewmembers are changed, the corresponding numbers of navigators required in those weapons systems are also changed.

In the past these changes were occasionally implemented with insufficient "lead time" to adjust the UNT output to mesh the graduating navigators with the force requirements. The result was that the rated resource management teams at the Air Force Military Personnel Center (AFMPC) were required to reassign aircrew members from one weapons system to another which required them to be cross trained not only into different aircraft but to aircraft performing different missions. If the proposed TAC/ATC training program is adopted, cross training between weapons systems would be complicated. UNT graduates, who would not be universally assignable due to mission specialized training in UNT, could not be assigned from WSO duties to classic navigator duties or vice versa by merely attending a Replacement Training Unit (RTU) course or Combat Crew Training School (CCTS) program as is done today. Additional training in the basics of the mission to which they would be reassigned would also be required. In other words, if the proposed training programs were adopted and unprogrammed force changes were implemented which were of sufficiently short notice that adjustments in UNT production would be inadequate to solve the imbalances, the current ability to cross train navigators via current programs would, in some cases, no longer be a viable option.

On the surface the issue might appear to be one of whether the increase in effectiveness from specialized training would offset the decrease in the flexibility of the navigator force. The issue becomes complicated by another management factor.

In 1974 a new management system entitled Rated Distribution and Training Management (RDTM) was established. RDTM consists of a management team with representatives of Headquarters Air Force Director of Operations, Director of Plans, Director of Personnel Plans, Director of Personnel Programs, Directorate of Manpower, the Air Force Military Personnel Center, Data Services Center, and representatives from operations and personnel divisions of each of the affected major air commands. The purpose of establishing RDTM was to increase the accuracy in determining rated requirements by weapons system in order to meet Five Year Defense Program (FYDP) requirements.[6]

RDTM became the vehicle that translates FYDP requirements into individual aircrew requirements and weapons systems training requirements for the rated force, both pilots and navigators. Assuming that the proposed TAC/ATC program is implemented, the following issues would evolve: what benefits would specialized training produce and can the Air Force manage the navigator force within current personnel policies and RDTM distribution and training requirements. Additionally, if the Air Force personnel resource management system cannot accommodate the proposed program under current guidelines, it is essential to know what changes in the RDTM methodology and personnel distribution would be required in order to accommodate the program.

STATEMENT OF THE PROBLEM

If the proposed TAC/ATC training program is implemented, what would be the benefits derived, and could the navigator force be managed within current personnel policies and RDTM methodology? If not, could the resulting management consequences be accommodated?

QUESTIONS TO BE ANSWERED

Numerous impacts must be analyzed before a definitive recommendation can be made on this issue. The scope of these considerations range from an analysis of costs of the proposed program as compared to the present system to the ability of the Air Force to manage the navigator and WSO career fields partitioned by separate training programs. The following areas will be examined:

a. A cost/benefit analysis of the two programs.

b. The impacts on WSO readiness.

c. The impacts on the management of the navigator and WSO resource under the proposed program to include analyzing the requirement to cross train between the two segments of the navigator force.

d. The effects of UNT distribution constraints from specialized training.

DELIMITATIONS

This thesis concerns the TAC/ATC training proposal for separate WSO training for fighter and fighter reconnaissance aircraft only and will not address other subspecialties of the navigator force such as Navigator Bombardiers or Electronic Warfare Officers (except for those who are to be employed in fighter systems). Navigators in the grade of Colonel and above will not be addressed as they are not considered "line" aircrew assets by AFMPC. Navigators in FB-111 and SR-71 aircraft are also excluded from the scope of this thesis. Though these navigators perform many of the functions characteristic of WSO duties and are sometimes called WSOs, they are, with rare exception, assigned to Strategic Air Command which specifies, via Air Force Manual 50-5, their unique entry prerequisites to the training programs of these systems.[7] Additionally,

SAC has recommended a "status quo" approach to the training of their personnel.[8]

Reserve component WSO training will not be addressed in this thesis. Though WSO manning requirements in Air National Guard units are projected to increase over the next five years, conversion from other weapons systems, recruitment of navigators and Naval Flight Officers who have separated from active duty, and the possible use of pilots in WSO positions are expected to accommodate the increase in Guard requirements. The Air Force Reserve, not being projected to receive any fighter aircraft with WSO positions, is not expected to require WSOs in the foreseeable future.[9]

METHODOLOGY

An analysis of the current and proposed training programs will be conducted to determine the advantages and disadvantages of the two programs. An analysis of the distribution and flow of graduates of the current UNT program will also be conducted and compared to an analysis of the changes which the proposed program would effect. A study of the amount of cross training required in past management of the navigator resource as compared to cross training requirements in the FYDP as based on RDTM distribution requirements will be conducted in order to determine the magnitude of the cross training problems.

DEFINITIONS

For reader convenience, technical terms will be explained either at their point of use or in the glossary, appendix A.

CHAPTER 1

FOOTNOTES

[1]Ted R. Sturm, "Navigator Training Overhauled," Airman, 16 (August 1972), p. 42.

[2]Edgar Ulsamer, "UNTS, The Last Word in Navigator Training," Air Force Magazine, 56 (August 1973), p. 56.

[3]Air Force Inspection and Safety Center (AFISC), Statement of Fact from the "Functional Management Inspection of Tactical Air Forces Aircrew Training, PN 77-603," 1 November 1976--15 September 1977, AFISC, Norton AFB, California. (Included as appendix B.)

[4]"Corona Ace Study," Air Force Inspection and Safety Center (AFISC), Norton AFB, California, 1 March 1977.

[5]General John W. Roberts, Commander, ATC, letter to General Robert J. Dixon, Commander, TAC, 11 April 1977. (Included as appendix C.)

[6]USAF Program Guidance, 20 September 1974, DAF, HQUSAF, Washington, D.C., p. 50.

[7]Air Force Manual 50-5, USAF Formal Schools Catalog, Volume II, 1 September 1976, DAF, HQUSAF, Washington, D.C.

[8]Major James T. Stolp, Chief of Navigator Career Management, AFMPC/DPMROR4 Briefing to Colonel Thomas E. Olsen, Chief of Rated Assignments, AFMPC/DPMROR, 11 January 1977, HQ AFMPC, Randolph AFB, Texas.

[9]Roger E. Rosenberg, Major, USAF, telephone inquiry to the Weapons Systems Officer Resource Management Section, Headquarters, Air Force Military Personnel Center, 25 April 1978, Randolph AFB, Texas.

CHAPTER 2

REVIEW OF RELATED LITERATURE

OVERVIEW

The review of literature related to the impacts and issues involved with specialized WSO training will include:

1. An analysis of the navigator/WSO training production requirements for the Five Year Defense Program (FYDP).

2. An analysis of the present UNT production and distribution requirements.

3. An analysis of the proposed specialized training program to include the changes in distribution and flow that the program would effect.

NAVIGATOR/WSO PRODUCTION REQUIREMENTS

It is essential, before beginning an analysis of the impacts of the specialized training proposal, to understand the magnitude of requirements for the total number of both navigators and WSOs that must be produced from the present time through the FYDP in order to satisfy total aircrew, staff, and related requirements. Table 1 contains a breakout by fiscal year of the combined UNT production that must be met during fiscal year 1978 plus the FYDP (1979 through 1983).[1] This breakout was compiled through the use of Rated Distribution and Training Requirements (RDTH) methodology which compares fiscal year end strength requirements to current inventory minus the appropriate weapons system world attrition. Attrition is based on historical loss data by individual weapons system

and includes losses through death, separations (voluntary and involuntary), medical groundings, and promotion to the grade of O-6.

TABLE 1

FISCAL YEAR NAVIGATOR PRODUCTION REQUIREMENTS

	FY 78	FY 79	FY 80	FY 81	FY 82	FY 83
Total Required Navigator Production	500	550	600	650	700	700

Though the production requirements increase through the FYDP until it stabilizes at 700 per year in fiscal year 1982, it is not correct to state that overall navigator authorizations are continuously increasing. Active inventory navigator manning temporarily exceeds present requirements in some weapons systems and related staff requirements. This overage was brought about by several factors, the following examples having the greatest impact:

1. The decrease in requirements for the rated supplement (rated aircrew members serving in non-flying duties to augment the manning in support duties).

2. Reduction in navigator requirements for the C-141 aircraft due to the purchase of inertial navigation systems and subsequent conversion of the aircrew positions to enlisted "systems operator" billets.

3. The reduction of some F-4 and KC-135 WSO and navigator requirements brought about by removing limited numbers of these aircraft from the active inventory.[2]

A breakout by fiscal year of the WSO portion of the total UNT production requirements via Rated Distribution and Training Management (RDTM) methodology is shown in table 2. Tactical reconnaissance requirements are displayed separately from the tactical fighter figures because

RDTM methodology separates tactical reconnaissance into a "weapons system world" apart from that of the tactical fighter. The rationale for dividing the two in RDTM computations is that while TAC fighter WSOs cross train between weapons systems within the fighter world such as the F-4 to the F-111, and require training primarily in the aircraft subsystems and performance parameters, the tactical reconnaissance expertise is considered a unique skill unto itself and the skills are not readily transferrable to fighters or vice versa. The tactical reconnaissance mission is, however, far more closely aligned to the tactical fighter WSO function than it is to "classical" navigator duties and is considered a true WSO function.

TABLE 2

FISCAL YEAR WSO PRODUCTION REQUIREMENTS[3]

	FY 78	FY 79	FY 80	FY 81	FY 82	FY 83
Required Fighter WSO Production	113	148	136	125	89	84
Required Recce WSO Production	20	19	17	17	19	19
Total WSO Production	133	167	153	142	108	103

It should be noted that the above figures represent WSO production requirements based on the projected loss of some WSO positions as the tactical fighter force converts, in part, to single seat fighter aircraft. If the acquisition rate of the new weapons systems is less than projected and F-4 aircraft are retained in the active inventory for a greater length of time, these numbers would increase. Additionally, studies are currently being conducted to determine the feasibility of producing two-seat variants

of F-15, F-16, and A-10 aircraft which would require WSOs in the second seat. If any were purchased, WSO production would have to be increased to provide adequate numbers of aircrewmen to satisfy requirements. The combined effects of adopting both of the above alternatives would result in WSO production requirements far in excess of those cited in table 2.

A breakout by individual weapons system in the fighter world beyond the FY 1978 time frame is not addressed in this thesis to avoid the necessity of classifying this report. FY 1978 announced production figures are, however, listed in table 3 and roughly approximate the production requirements throughout the FYDP. F-4 and F-105 systems will be withdrawn in part from the active inventory over the next ten year period as they are replaced by A-10, F-15, and F-16 aircraft, and the shift will be toward navigator/WSO production primarily oriented toward F-111, EF-111, RF-4C, and F-4G Wild Weasel aircraft.

TABLE 3

FY 1978 WSO PRODUCTION BY WEAPONS SYSTEM

	Total	F-'	F-4C/G	F-111	EF-111	RF-4C
Fighter/Tactical Reconnaissance UNT Production Requirements for FY 1978	133	45	18*	45	5*	20

*Denotes that the WSO must also be a graduate of Electronic Warfare Training (EWT).

HISTORICAL BACKGROUND OF THE CURRENT SYSTEM

Though the proposal for specialized WSO training has received considerable attention in recent months, the issue is not new. Since the early 1950s, limited numbers of navigators were assigned to Air Defense Command (ADC) interceptor aircraft such as the F-89, F-94, and F-101.

Some of these navigators, then called Radar Intercept Officers (RIOs) did, in fact, receive specialized training apart from UNT for those missions; however, the specialized training program was discontinued around 1960 because limited numbers of officers were involved in the RIO role and because the F-89 and F-94 had been withdrawn from the active inventory. The requirements for the RIO were declining and only the F-101 was remaining in the active inventory. A few navigators served in attack weapons systems such as the B-57, A-26, B-26, and the "G" variant of the F-105 during the 1960s and performed duties similar to the WSO of today.[5] Again, the numbers of navigators who served in these aircraft were relatively small and of insufficient numbers to warrant specialized training other than the normal aircraft transition. The specialized training issue remained shelved until the aircrew requirements of Southeast Asia produced new problems in the management of pilots and navigators.

During the late 1960s the Air Force began assigning navigators to F-4, RF-4, and F-111 aircraft to serve in the second seat on a test basis to determine if navigators could be used instead of pilots to help ease the pilot shortage. Since navigators received training in UNT on radar techniques and basic navigation, two of the functions characteristic of the duties of the second seat in these aircraft, they proved capable of acceptable performance in this new role. The positions were soon converted permanently to navigator/WSO slots, and large numbers of navigators were assigned to WSO functions.[6] Shortly thereafter, studies and proposals for specialized training to further enhance the capabilities of WSOs began. Interest in the issue greatly increased in 1972 when the F-4 back seat conversion from Pilot Systems Officers (PSOs) to WSOs was near completion.

UNDERGRADUATE NAVIGATOR TRAINING TODAY

Undergraduate Navigator Training currently consists of a 140 training day (approximately 33 calendar week) course containing 898.5 hours of instruction which includes 382 hours of Academic Navigation Training, 169 hours of Flight Simulator Training, 24.5 hours of T-37 Flying Training (of which 6.5 hours are mission),* 185 hours of T-43 Flying Training (of which 105 hours are mission), and 138 hours of General Military Training.[7] A schematic of the program is shown in figure 1 and the syllabus is outlined in appendix D. Upon completion of the UNT program, the officer receives his aeronautical rating of navigator. From UNT, the newly graduated navigator is then eligible for either further specialized training in Electronic Warfare, Navigator/Bombardier Training, or he may be assigned to a Replacement Training Unit or Combat Crew Training Course for instruction in operational aircraft.

DEVELOPMENT OF THE SPECIALIZED TRAINING PROPOSAL

One of the first comprehensive studies of a specialized training proposal to reach the airstaff was developed by Headquarters Air Training Command's (ATC) Navigation Training Division and presented to the Air Force Military Personnel Center's (AFMPC) Navigator Resource Management Section in December 1974.[8] This study was initiated by ATC following the 30 October to 1 November 1974 USAF Navigator Training Conference at Mather Air Force Base, California.

At that joint Air Staff and Major Command training conference, two issues were presented that formed the basis for the ATC study. The

---

*Total Flying Training includes aircrew preparation, briefing, flying the sortie, and debriefing. "Mission hours" denotes the time spent airborne.

AFMPC's Navigator Resource Management Section representative presented a briefing on the newly developed RDTM concept of rated resource management and included remarks concerning the limited amount of cross flow between weapons systems that would occur during the FYDP. Tactical Air Command's (TAC) representatives provided a status report on the navigators that were being trained for WSO duty and pointed out some of the problems concerning the ability of the average UNT graduate to adapt to the role of WSO.

The significance of the AFMPC led portion of the conference was that the Major USAF Commands' representatives were given a comprehensive picture of projected navigator resource management for the FYDP. The report demonstrated that navigator force requirements were being stabilized throughout the Air Force and cross training between weapons systems would be reduced to a fraction of the amount previously required during the years of the Southeast Asian conflict. In effect, the requirements for training to replace normal attrition exceeded the requirements to cross train for Southeast Asian combat requirements.[9] Though not specifically stated during the conference, the AFMPC inference was that the necessity for producing universally assignable navigators in the future was of somewhat less importance than before.

Headquarters ATC then initiated a study to develop a specialized training program. Key assumptions in the study included the facts that 50 percent of the training which a navigator receives in the UNT program is nonapplicable to WSO duties in tactical fighter and tactical reconnaissance missions.[10] Navigation techniques such as day and night celestial navigation, grid navigation, and global navigation are not performed in the WSO role, and fighter systems are not equipped with the navigation instruments to utilize those techniques.

Based on these facts, ATC/DON submitted the 1974 Specialized Training Proposal to the air staff for consideration (appendix E). The proposal generated little enthusiasm and was deferred for later consideration. Informal air staff response to the proposal indicated that the program was considered to be undesirable from the navigator resource management standpoint because of the utilization constraints on navigators who would not be universally assignable.

Undeterred by the lack of response to the proposal, ATC's navigator training division continued the study of specialized training and on 30 April 1976 submitted a greatly expanded study to the air staff (appendix F).[11] In this proposal, ATC provided course syllabus outlines, quantified the amounts of "over training" that a WSO receives surplus to his functions in fighter and fighter/reconnaissance missions under the current training program, and proposed substitute courses specifically oriented toward proficiency in WSO functions. Of particular significance, subjects including aerodynamics/maneuvering familiarization, air-to-ground weapons delivery, air-to-air weapons delivery, nuclear delivery techniques, weapons ballistics, intercept and air-to-air combat techniques were outlined in the proposal. As in the case of the 1974 proposal, the 1976 specialized training proposal generated little enthusiasm and was deferred for later consideration.

The issue lay dormant until early 1977 when the Corona Aces study on tactical fighter capabilities was released, and preliminary findings of the AFISC FMI report were analyzed. It was then that the Commander of Air Training Command in concert with the Commander of Tactical Air Command convened a series of conferences designed to develop a training program to redress the shortcomings of the current UNT training program.

THE 1977 SPECIALIZED TRAINING PROPOSAL

The specialized training proposal, as presented at the 17-19 May 1977 Joint ATC, TAC, and Airstaff conference, consisted of a program whereby navigators would complete the basic required courses common to both the navigators who would be assigned to "classic" navigator functions and to those who would be assigned to WSO duties. These common courses include Aviation Physiology, Basic Airmanship, Navigation Procedures, and Navigation Systems. At that point, the course would be divided into two separate programs. The navigators scheduled for regular navigator duties would complete a course similar to the one in effect today, while the navigators who are to be assigned to WSO duties would branch off and attend training blocks designed to prepare the WSO for his particular expertise requirements (appendix G). A flow diagram of the current program and the proposed "split" program are included in figure 1. Both facets of the proposed and current training programs consist of 140 training days (382 academic hours).

Along with the changes in the academic program are changes in the number of missions in T-43 and T-37 aircraft. The current training program includes five T-37 missions in which the student receives approximately 6.5 mission hours in the aircraft and 21 T-43 missions in which the student receives approximately 105 hours in the T-43 aircraft. In the proposed training program the navigator to be assigned to the "classic" navigator function would receive flying training similar to the current program. The navigator headed for WSO duties would receive 17 T-37 training sorties or approximately 23.4 T-37 hours and the T-43 sorties would be eliminated. A comparison of the two flying training programs is shown in table 4. The amount of academic hours would remain approximately the same and simulator missions would be reduced from 21 to 15.

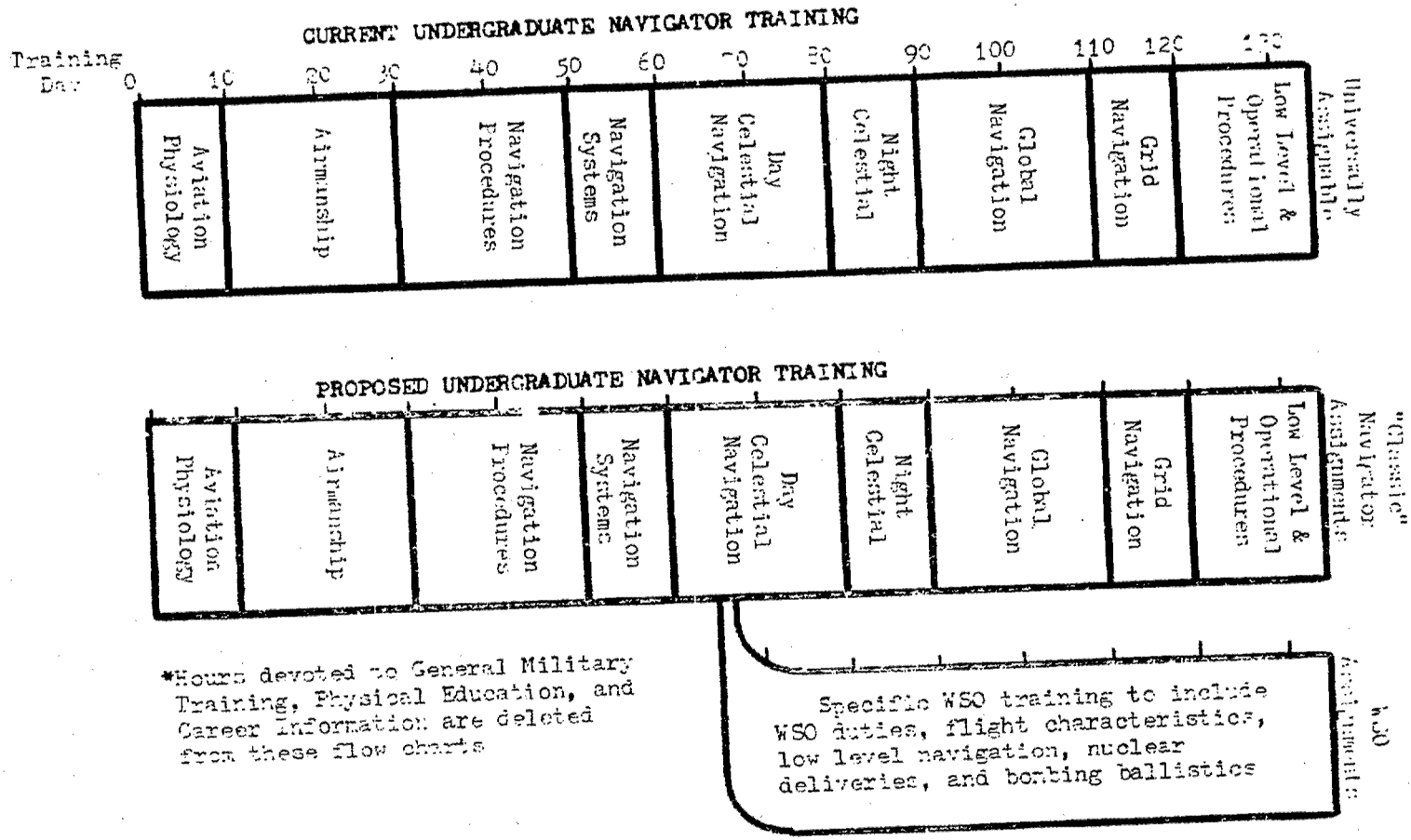


Figure 1. Undergraduate Navigator Training Flows

TABLE 4

UNDERGRADUATE NAVIGATOR TRAINING

Current Program		Proposed Program*		
Academics	- 382 hours	Academics	- 382 hours	
Simulator	- 21 sorties		Navigator	WSO
Flying	- 26 sorties (5 T-37) (21 T-43)	Simulator	- 21 sorties	15 sorties
		Flying	- 26 sorties (5 T-37) (21 T-43)	17 sorties (17 T-37) (0 T-43)

*1977 Alternative Training Proposal, 17-19 May 1977 Airstaff/ATC/TAC Conference.

Because of the greater number of sorties and hours in the T-37, elimination of T-43 sorties, and reduction in simulator missions, the cost between the two programs will change. Cost analysis of the proposed program in comparison to the current program will be examined in chapter 3.

CHAPTER 2

FOOTNOTES

[1]Roger E. Rosenberg, Captain, USAF, telephone inquiry to the Weapons Systems Officer Resource Management Section, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 19 September 1977.

[2]Nolan W. Schmidt, Major, USAF, Chief of Weapons Systems Officer Resource Management, briefing to the Chief of Rated Assignments, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 16 May 1977.

[3]Roger E. Rosenberg, Captain, USAF, telephone inquiry to the Weapons Systems Officer Resource Management Section, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 19 September 1977.

[4]Ibid.

[5]Ronald E. Schulz, Major, USAF, "TAC Navigators: Meeting the Challenge," The Navigator, 23 (Spring 1976), p. 13.

[6]Ibid.

[7]ATC Syllabus N-V6A-D, "Syllabus of Instruction for Undergraduate Navigator Training," February 1977, DAF, Headquarters, Air Training Command, Randolph AFB, Texas, p. 5.

[8]Directorate of Navigator Training, Headquarters, Air Training Command, "Specialization, A Proposal," DAF, Headquarters, Air Training Command, Randolph AFB, Texas, December 1974.

[9]Billy D. Tudor, Major, USAF, Navigator Resource Manager, preconference briefing to AFMPC/DPMRORA, HQ USAFMPC, Randolph AFB, Texas, 25 October 1974.

[10]Directorate of Navigator Training, Headquarters, Air Training Command, "Specialization, A Proposal," DAF, Headquarters, Air Training Command, Randolph AFB, Texas, December 1974, p. 14.

[11]Directorate of Navigator Training, Headquarters, Air Training Command, "Comparison of Current and Specialized Navigator Training Programs," DAF, Headquarters, Air Training Command, Randolph AFB, Texas, 22 March 1976, p. 25.

CHAPTER 3

UNDERGRADUATE NAVIGATOR TRAINING COSTS

OVERVIEW

Initiating a comparison between alternative training programs necessarily requires establishing common elements by which the two programs can be measured and in this age of austere funding, one of the more obvious denominators is cost. This comparison of programs will, therefore, begin with a cost analysis of the current UNT program and compare it with the proposed specialized training program.

To establish a base with which to begin a cost analysis of the two alternative programs, Air Training Command's Navigator Training Division provided the current costs of the present UNT program as $67,400.00 per graduated student.[1] Since the lengths of both the current and proposed programs in both academic hours and flying simulator hours are roughly similar, the costs of these facets of the programs should not change appreciably.[2] Additionally, the total number of required UNT instructors is not expected to vary.[3]

It has been suggested that the instructor navigators required for the WSO portion of the proposed training program might represent increased costs to the Air Force. This concern is based on the following UNT instructor assignment considerations: (1) all ATC instructor navigators must have completed operational tours; (2) the instructors who are to teach WSO courses should come from operational WSO duties; and (3) the costs of producing fully qualified WSOs generally exceeds that of producing fully qualified navigators from most other weapons systems.

in actuality, current assignment policy has already accommodated the impacts of this issue.

Presently, the distribution of instructors assigned to UNT is governed by Rated Distribution and Training (RDTM) methodology. RDTM computes the total number of operational navigators from each weapons system and determines the fair share to be apportioned to UNT instructor duty. Currently, the WSO force has a fair share of navigators "in place" as UNT instructors and increased numbers of WSOs would not be required for the specialized WSO program if it were to be adopted.[4] The WSO instructor cost aspect would, therefore, not increase over that experienced under the current program. The difference in the costs of the two UNT training programs would then be the difference between the current flying training program of five T-37 sorties and 21 T-43 sorties as compared to the 17 T-37 sorties and no T-43 sorties of the proposed training program for the WSO "track" plus the attendant costs of the changes in the number of T-37 sorties.

THE COSTS DEFINED

Operating costs per flying hour for T-37 and T-43 aircraft as provided by HQ ATC/DON is $224.00 per hour for the T-37 and $1,267.00 per hour for the T-43.[5] These costs include depot maintenance, fuel, base level maintenance, and operation. From these figures we can compute the raw flying costs per graduated student under the current program as $14,759.50. (See table 5 for actual cost breakdowns.) This cost would not change appreciably under the proposed program for the navigator on the "classic" navigator track; however, the raw flying costs for each navigator graduating on the WSO track would be $5,241.60 or an apparent savings of $9,517.90 per student. If we were to apply this savings to

TABLE 4

FLYING HOUR AND FLYING TRAINING COST COMPARISONS

CURRENT PROGRAM

Aircraft	Sorties	Average hours	Total hours	Cost/ hour	Total flying cost
T-37	5	1.3	6.5	$224.00	$1,456.00
T-43	21	5.0	105.0	$1,267.00	$13,303.50*
			Total costs of flying time/student		$14,759.50

SPECIALIZED PROGRAM

Conventional Navigator

Aircraft	Sorties	Average hours	Total hours	Cost/ hour	Total flying cost
T-37	5	1.3	6.5	$224.00	$1,456.00
T-43	21	5.0	105.0	$1,267.00	$13,303.50*
			Total costs of flying time/ conventional student		$14,759.50

WSO Track

Aircraft	Sorties	Average hours	Total hours	Cost/ hour	Total flying cost
T-37	17	1.3	23.4	$224.00	$5,241.60
			Total costs of flying time/ WSO student		$5,241.60

*10 students per T-43 sortie.

base for ATC produced in FY 1979, we would achieve an apparent flying cost savings of $1,561,417.70. Additionally, a collateral benefit of saving 105 hours of flying time per WSO student in the T-43 aircraft is realized. Multiplied by the 163 students to be trained in FY 1979, this amounts to 17,226 total student flying hours saved. When divided by 10, the number of students normally trained per one T-43 sortie, 1,722 hours of T-43 flying time is saved.

In the previous paragraph the terms "apparent savings" and "apparent flying costs" were used. It must be realized that using the same FY 1979 example, the T-37 flying hours would have to be increased by 16.9 hours per student WSO or a total of 2,754.7 hours for the fiscal year. It was pointed out in the 17 May 1977 conference that much of the increased flying time could be achieved by increased utilization of T-37 aircraft on hand at Mather AFB, California, the USAF navigator training base; however, it was estimated that, in all probability, two additional T-37 aircraft and two instructor pilots would have to be procured to achieve this increase in sorties.[6] ATC currently has access to two aircraft; however, they would come from assets which are currently in "flyable storage" which means that procurement costs would not be necessary, but some minor repair, refurbishing, and refitting may be required.[7] These exact costs are not currently available, but since no modifications are required and the only costs involved are for returning the aircraft to flying status, it is estimated that refurbishing would amount to a one-time cost of less than $2,000.00 per aircraft.[8] The actual costs of returning these aircraft to operational status is identified as an item requiring further study.

The costs of procuring the required two additional instructor pilots fall into two categories, the one-time costs of assigning them to Mather AFB and qualifying them as instructors in T-37 aircraft, and the sustained costs of their annual salaries. The standard estimate of Permanent Change of Station (PCS) costs is $2,000.00 per move.[9] Assuming that 20 hours of T-37 transition training is required per pilot to qualify them as instructors, the one-time costs would be the total of the $4,000.00 PCS costs plus the $8,960.00 T-37 flying training costs, or a total of $12,960.00. Assuming a normal tour length of three years, these one-time costs would average $4,320.00 per year. Adding the average annual salary of a captain on flying status of $21,481.00,[10] the total estimated costs per year for the two additional instructor pilots would be $47,282.00.

Concern has been expressed that since these pilots would be training WSOs for fighter and tactical reconnaissance duties, they should be procured from operational fighter and reconnaissance units which are currently short of excess personnel. During the TAC/ATC conference of 17-19 May 1977, TAC Instructional Systems Development representatives agreed that the basic skills that these pilots would be teaching would not require pilots with previous fighter or reconnaissance experience and this issue should not be a major constraint.[11]

SUMMARY

Analyzing the impacts of the proposed program in terms of UNT production costs indicates that the potential for savings does exist. These savings, however, may be partially offset by factors for which reliable cost estimates cannot be determined without further study. Specifically, the raw annual flying cost savings of $1,551,417.70 achieved through the increase in T-37 training and the elimination of T-43 flying

hours must be reduced by the estimated $4,000.00 cost of returning two T-37 aircraft to operational duty. Assuming this cost to be spread over a five-year period, the cost would average $800.00 per year.

The two T-37 instructor pilots required for the proposed program would also partially offset the apparent savings. Assuming the validity of an annual cost of $47,282.00 for the instructor pilots, their costs plus the cost of recommissioning two T-37s amount to $48,082.00 per year. Subtracting this figure from the $1,551,417.70 apparent savings and an estimated annual savings of $1,503,335.70 results.

Though the specialized training program was intended to be an operational capability enhancement issue rather than a program to reduce training costs, it would appear, pending further study, that the proposed program would substantially reduce the costs of Undergraduate Navigator Training.

CHAPTER 3

FOOTNOTES

[1]John A. Rogert, Lt Colonel, USAF, telephone inquiry to the Director of Navigator Training, Headquarters, Air Training Command, Randolph AFB, Texas, 16 November 1977.

[2]Ibid.

[3]Ibid.

[4]Nolan W. Schmidt, Major, USAF, Chief of Weapons Systems Officer Resource Management, briefing to the Chief of Rated Assignments, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 16 May 1977.

[5]John A. Rogers, Lt Colonel, USAF, telephone inquiry to the Director of Navigator Training, Headquarters, Air Training Command, Randolph AFB, Texas, 16 November 1977.

[6]Gerald S. Venanzi, Major, USAF, 323 FTW/DOTCU, briefing to the USAF/TAC/ATC/MPC WSO Course Proposal Conference, Mather AFB, California, 18 May 1977.

[7]Ibid.

[8]Gerald S. Venanzi, Major, USAF, telephone inquiry to the ex-Deputy for Operations and Training Course curriculum development, 323d Flying Training Wing, Mather AFB, California, 30 April 1978.

[9]Roger E. Rosenberg, Captain, USAF, telephone inquiry to the Weapons Systems Officer Resource Management Section, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 19 September 1977.

[10]Ibid.

[11]Terrence M. Murphy, Major, USAF, HQ TAC/DOXS, briefing to the USAF/TAC/ATC/MPC WSO Course Proposal Conference, Mather AFB, California, 18 May 1977.

CHAPTER 4

THE TWO PROGRAMS AFTER UNT

POST UNT TRAINING FLOW

To this point the specialized WSO training proposal has been addressed in terms of UNT costs; however, the primary impetus behind this proposal is to produce a more capable WSO for the operational units. In order to examine the impacts of the program "down stream" from UNT and determine the advantages or disadvantages of the proposal, it is necessary to first examine the assignment/training flow that the future WSO follows from completion of UNT until the point where he is "operationally ready" in his combat unit.

Figure 2 depicts the training school sequence for navigators from UNT to the operational units. The figure derives its complexity from the fact that each of the three major weapons systems which use WSOs differ in their prerequisites. To begin this study of the post-UNT aspect of the specialized training proposal, a brief explanation of each of the training courses following UNT must be provided.

Electronic Warfare Training (EWT) is an 18-week course which selected UNT graduates attend following UNT completion. The purpose of the course is to give the graduating WSO advanced training in electronic warfare to include electronic countermeasures, electronic counter-countermeasures, penetration tactics, etc. This "no-fly" "academics only" course is a prerequisite for WSOs who will eventually be assigned to Wild Weasel variants of the F-4 and to WSOs who will eventually be assigned to EF-111

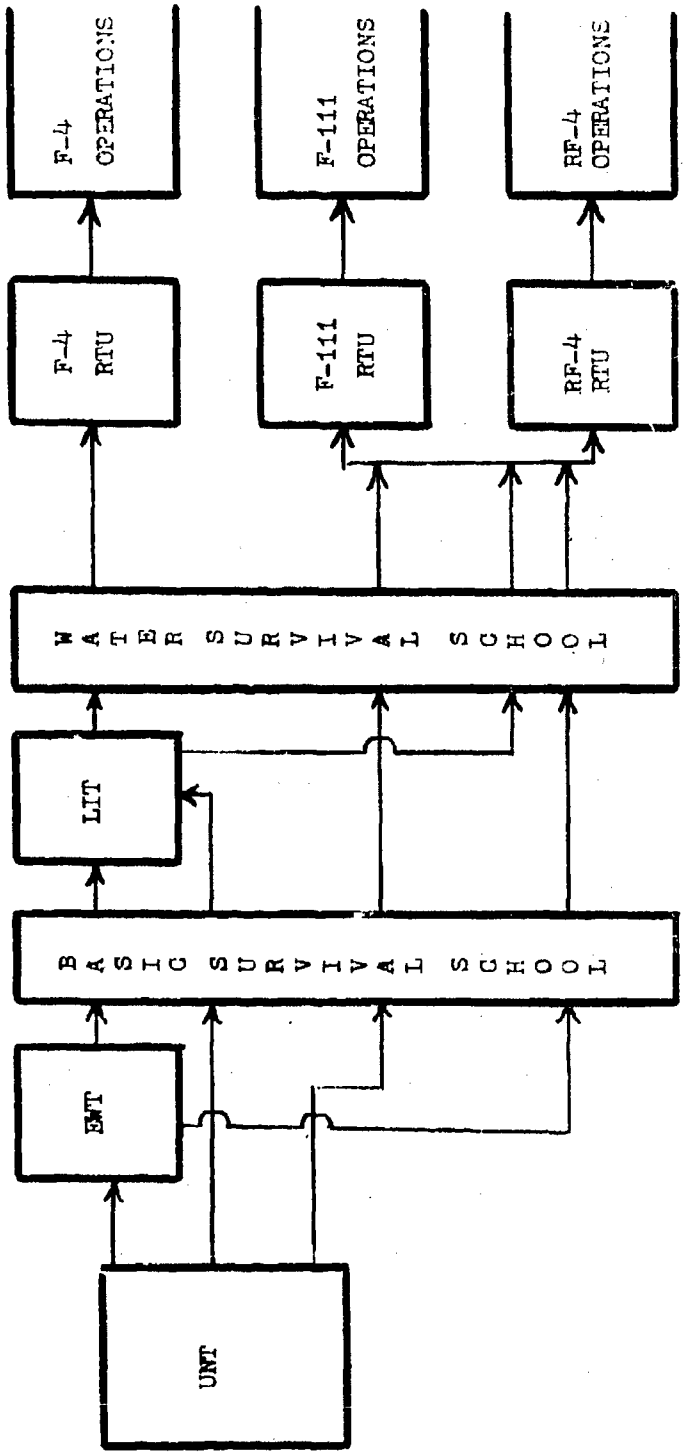


Figure 2. Post-UNT Pipeline

aircraft. In the FY 1978 RDTM distribution, 23 WSOs will be trained in NWT, 13 will be assigned to F-4 aircraft, and 5 will be assigned to F-111 aircraft.[1]

The next two schools depicted in the training flow are Basic Survival School and Water Survival School. All WSOs are required to attend these courses prior to their first operational assignments, and most are scheduled through these survival courses TDY en route to either T-38 Lead-in Training (LIT) or the Replacement Training Unit (RTU). Following the survival schools, most WSOs will attend T-38 LIT. This six-week course provides the WSO with training in combat tactics in the supersonic T-38 aircraft. The purpose of this course is to place the student WSO in a high performance environment where he learns advanced fighter combat maneuvers and basic combat tactics in an aircraft less expensive to operate than its operational counterpart. This course is the student's first training under TAC instruction, and is mandatory for all WSOs who will be assigned to F-4 aircraft and is considered optional (but desirable) for WSOs who are headed for RF-4 or F-111 aircraft.[2] Current AFMPC guidance is to assign all WSOs through LIT whenever possible.[3]

After completing T-38 LIT, the WSOs are assigned to one of the USAF Operational Training Courses, either F-4, F-111A, F-111D, or RF-4C. These courses are also TDY en route to the WSO's operational assignment and are geared to training the WSO in the particular aircraft in which he will serve his next assignment. The courses include training in basic aircraft systems, weapons employment, and tactics appropriate for the aircraft to which the student is assigned. One significant distinction in the status of the RTU graduate should be noted at this time and it concerns

the qualification of the student who completes the RTU program. F-111 and RF-4C RTU graduates are fully qualified and require only a local area checkout and local procedures/mission orientation after they complete RTU while the F-4 WSO must complete his checkout in the organization to which he is assigned after RTU. This is done for two basic reasons: (1) to minimize the number of F-4 aircraft dedicated to training and (2) to provide training specifically oriented to the Wing's mission, either intercept, air superiority, conventional, or nuclear delivery. Hence, the graduating F-4 WSO will attend 30 to 90 days additional training in his operational wing after RTU graduation before he is considered "mission ready" and fully qualified.[4]

POST UNT BENEFITS ANALYZED

If we assume the statement in the 1976 ATC specialized WSO training proposal to be correct and that the last 50 percent of the training that a WSO now receives in UNT is not related to WSO duties,[5] a student WSO's learning trend relative to WSO skill requirements will resemble the curve between "A", "B", and "C" in figure 3. From point "A" to "B", the future WSO learns aviation physiology, airmanship, basic navigation procedures, and navigation systems, subjects considered universal to navigator functions in both the "classic" and WSO roles. Based on the ATC tenet that celestial, global, grid, and the type of low level which is taught during the second half of the course is not applicable to the WSO, his effective learning curve relative to WSO skills ceases the upward course and assumes a horizontal trend until completion of UNT. This is reflected in the segment of the curve between "B" and "C", figure 3.

If the proposed specialized program is implemented and WSOs are separated from the "classic" course of instruction at the point where

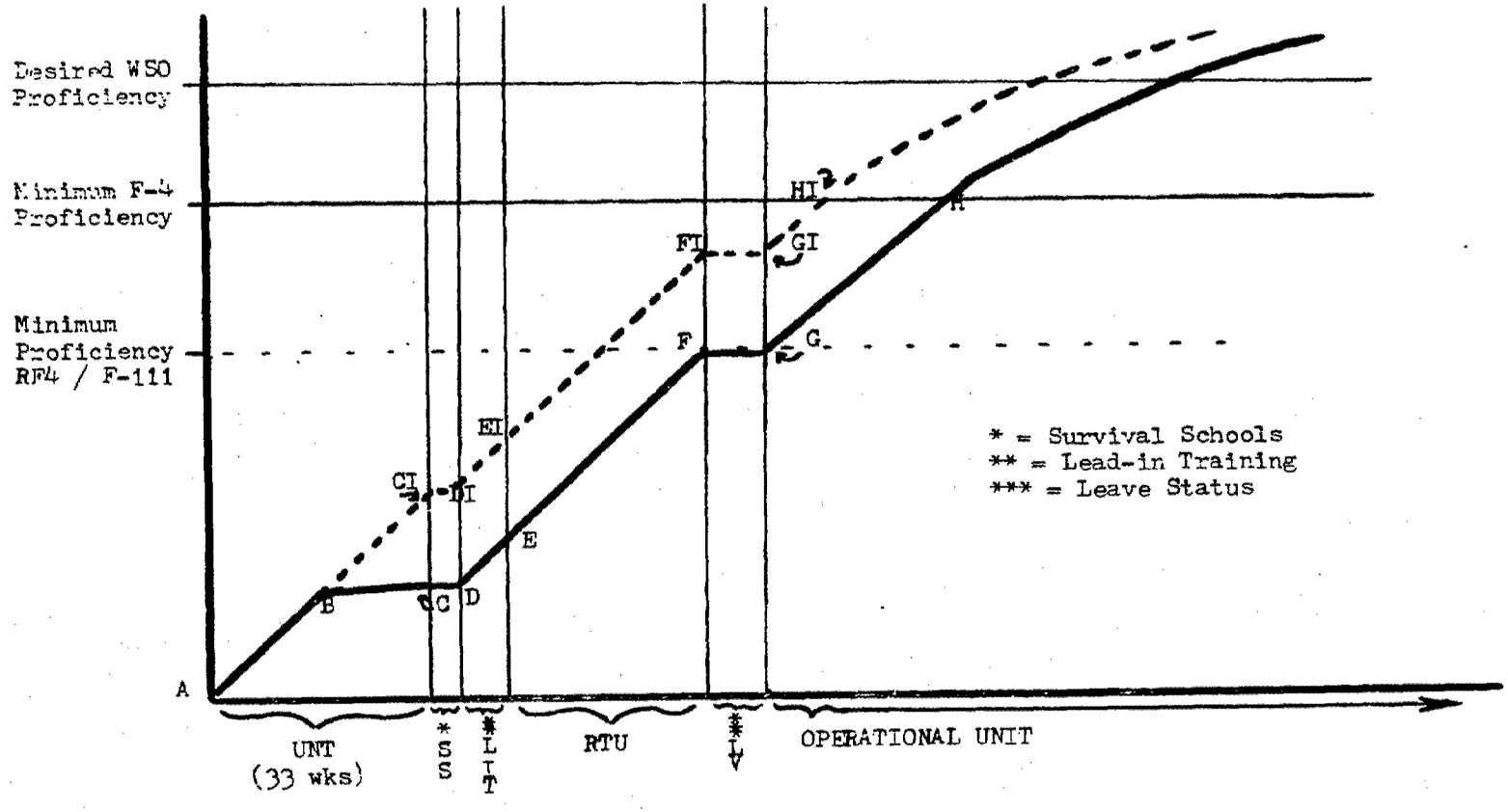


Figure 3. Proficiency Trends

training in celestial navigation techniques begins and courses specifically oriented toward building WSO skills are inserted, the learning curve relative to WSO requirements should continue an upward path from point "B" to ideally approximate the line between "A" and "CI". The UNT graduate completing the specialized WSO program should, therefore, be more skilled in WSO-related capabilities and would arrive at the next block of flying training considerably more advanced than his counterpart trained under the current system.

The next logical question becomes, "How much more advanced in WSO skills would the specialized training graduate be at UNT completion?" Since the specialized WSO program eliminates the last 50 percent of the current UNT program and substitutes a course of instruction specifically oriented to WSO skills, the graduate of the specialized WSO course would, ideally, be twice as competent as his conventionally trained counterpart. This is because he receives twice the amount of instruction pertinent to WSO duties as he now receives. The student WSO should enter LIT, the next segment of training, at roughly twice the level of proficiency as do WSOs trained in the current program.

HQ TAC/ISD has already developed a new LIT program designed to further develop WSOs who have completed the specialized UNT program and is prepared to implement the revisions whenever the first graduates of the specialized UNT program are produced.[6] This program is designed to accept the WSO at his "improved" level of capability and build WSO skills from that point. By way of illustration (figure 3), the student would begin LIT at point "DI" rather than "D" and graduates at point "EI" rather than point "E". Assuming the ability of TAC/ISD to produce a course as effective as proposed, the LIT graduate would then begin RTU considerably advanced relative to his conventionally trained counterpart.

Continuing this logic, the student WSO then enters RTU at "FI" rather than "F" and will graduate relative to "FI" over "F". At this point the distinction between the F-4 RTU graduate who is only "mission capable" and will require further operational "top off" training and the RF-4 and F-111 graduates who are "mission ready" becomes a factor. The F-4 graduate would require less "top off" training in unit to achieve mission ready status. The RF-4 and F-111 graduates would either be more proficient than is presently considered the minimum level required, or the training in the RTUs could be reduced.

QUANTIFYING THE BENEFITS OF SPECIALIZED TRAINING

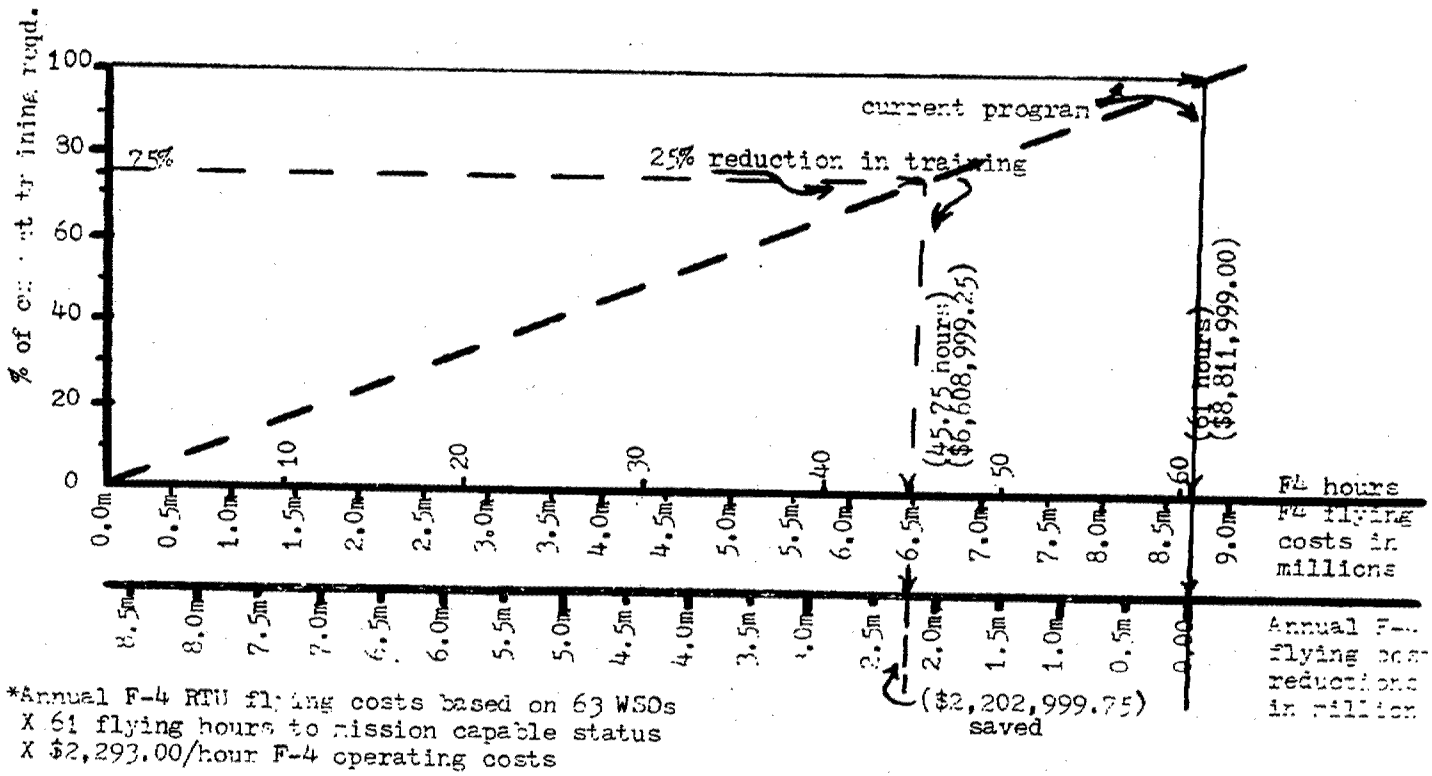
It should be recognized that the above scenario and accompanying diagram depicts trends rather than actual values. The problem now becomes one of attempting to quantify the benefits of the specialized program after UNT completion.

Accepting ATC's assumption that a more qualified WSO could be produced, and indeed, if more training hours are devoted to developing specific WSO skills the graduated product should be better qualified, the question becomes exactly how much more qualified is he, and how will that impact on post-UNT training? As with any untried training program, it is difficult to state with any degree of accuracy exactly how much better the graduate will be without first producing a sample under the new course and evaluating his progress after course completion. Before this "sample" is produced, though, it is possible to accomplish forms of sensitivity analysis on the program to determine relative cost advantages. In the following example the F-4 WSO training sequence is examined to analyze the possible impacts on costs and readiness.

IMPACT ON F-4 RTU TRAINING

Assuming that the UNT graduate has completed the specialized course and that the further training he has received from LIT has been of the nature to take him from his "improved" state and continued to advance him in his skills proportionately, he would arrive at the RTU considerably more proficient than current student WSOs. He would then require less training in RTU to achieve the current level of proficiency. To begin this sensitivity analysis, we can use current training factors as a departure point and then apply factors to determine actual cost advantages to the proposed program.

Presently, the costs of operating an F-4 is $2,293.00 per flying hour.[7] The average RTU graduate requires 61.0 RTU flying hours, is graduated"mission capable" and proceeds to his gaining unit for in-unit "top-off" training until he is fully qualified, or mission ready. If we apply this to the 63 WSOs who will be assigned to F-4 training from UNT in FY 1978, this amounts to 3,843.0 total F-4 hours flown in RTU to train F-4 WSOs. Multiply this figure by the $2,293.00 per F-4 flying hour, and the total RTU F-4 training costs are $8,811,999.00 to upgrade only the F-4 WSOs to mission capable status. If we assume that the WSOs under the specialized training program would be improved to the degree where 25 percent of the training could be eliminated and still achieve the same level of proficiency, the F-4 flying hours and associated costs would also be reduced 25 percent. In this instance, the WSOs trained in FY 1978 would require only 2,882.25 hours to upgrade to current mission capable status with a corresponding flying cost savings of $2,202,999.75. It should be recognized in this example that the 25 percent reduction figure may be either more or less than realistic, depending on the viewpoint of the reader. Figure 4 provides a ready means of depicting the



*Annual F-4 RTU flying costs based on 63 WSOs
X 61 flying hours to mission capable status
X $2,293.00/hour F-4 operating costs

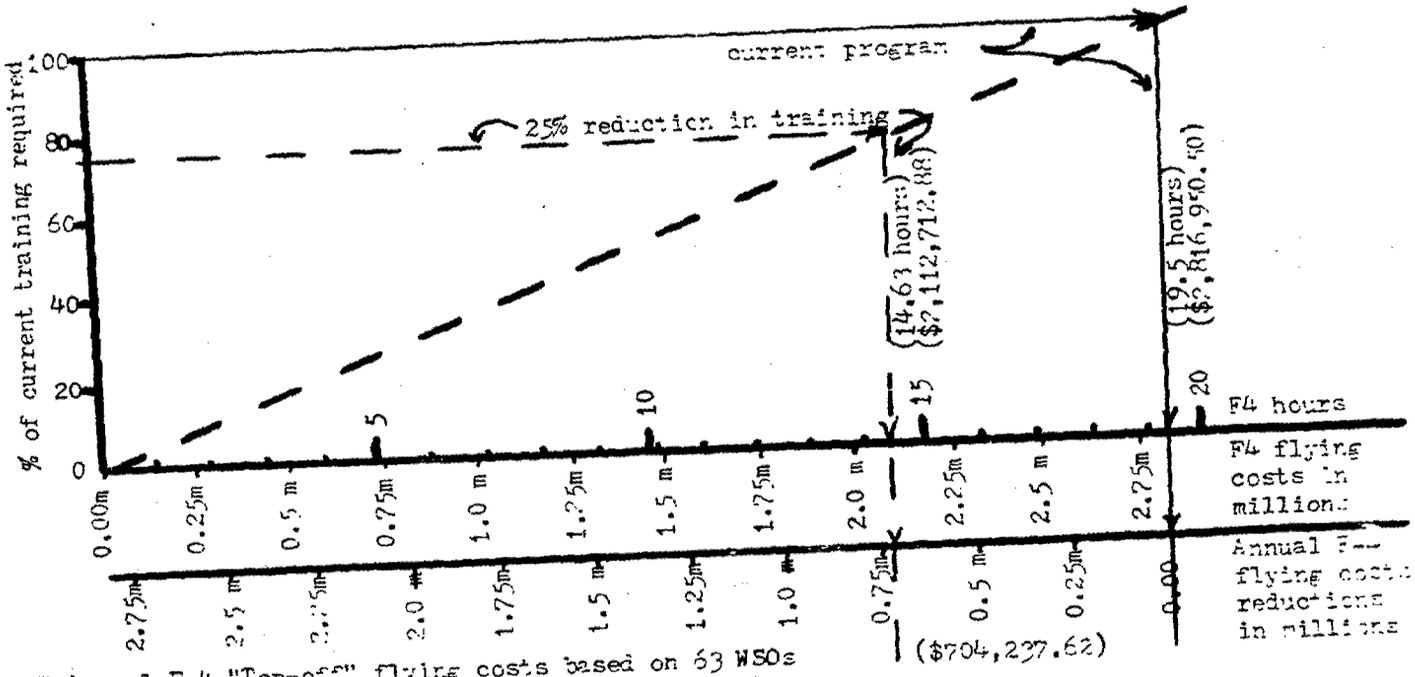
Figure 4. Annual F-4 RTU Flying Costs

impact of RTU savings specialized training would incur based on the reader's perception of the amount of improvement the specially trained WSO would acquire.

The vertical axis depicts the percentage of current training required. The horizontal axis depicts the number of flying hours and the cumulative costs of those hours. For example, if we assume the graduate of the specialized program would only require 75 percent of the training required of the present program, the reader enters the vertical axis at the percentage of the current training required and reads across to the reflector line and traces down to the number of flying hours required. Depicted below that line is the total F-4 flying hour training costs incurred to current mission capable status for all WSOs produced during FY 1978. This then can be compared to the current costs of $8,811,999.00 to determine the savings derived from specialized training in RTU.

IMPACT ON IN-UNIT "TOP-OFF" TRAINING

If the RTU graduate from specialized training is still advanced to the degree that "in-unit" "top-off training" can also be reduced, the opportunity for further savings may be present. The average RTU graduate requires 19.5 in-unit F-4 flying hours (which includes a flight evaluation) until he is "fully qualified" or "mission ready" in the aircraft.[8] If we apply this 19.5 hours of top-off training to the 63 WSOs assigned F-4 duty from RTU in FY 1978, this amounts to 1,228.5 total F-4 hours flown in the operational units to upgrade all F-4 WSOs in the fiscal year. Multiply this by the $2,293.00 per F-4 flying hour cost and the top-off F-4 training costs are $2,816,950.50 to upgrade all F-4 WSOs to fully qualified status. If these hours are reduced 25 percent (4.875 hours per WSO), the



* Annual F-4 "Top-off" flying costs based on 63 WSOs
X 19.5 flying hours to fully qualified status X
$2,293.00/hour F-4 operating costs

Figure 5. Annual F-4 Top-off Flying Training Costs

costs of in-unit qualifications would realize a savings of $704,237.62. A top-off flying training cost/hours graph is depicted in Figure 6.

It should be recognized that reductions in F-4 training sorties achieved under the specialized program may be handled by management in a number of ways. Management could continue to have the bulk of the F-4 instruction take place in the RTUs which would significantly reduce the training burden on the operational units, or might reduce RTU training in order to place more F-4 aircraft into combat units as a readiness initiative. The degrees between these two alternatives is unlimited; however, the basic techniques outlined above can be adapted to determine cost savings by merely determining the percentage of the number of hours in either RTU or in-unit that is considered realistic and construct the graph appropriately.

COMBAT READINESS, F-4

Readiness, measured strictly in terms of the USAF Readiness Reporting System, will be favorably affected by any reductions in the amount of F-4 top-off training required in the operational units. Since the crew ratio and staff authorizations in operational units remain static despite the percentage of WSOs in combat ready status, reductions in the time required to achieve combat ready status will increase the percentage of fully qualified WSOs. This situation is most significant where the tour lengths are 12 months long. In order to quantify the effects of reduced in-unit training that the specialized program might incur, we must first examine the parameters of current short-tour assignments.

F-4 WSOs are assigned to Korea on 12-month tours. Due to temporary groundings, medical suspensions, selection for staff duty, tour curtailments for humanitarian reasons, permanent changes of assignments

within the base, etc., the average length of time a crewmember serves on a crew (including training time) is 10.5 months.[9] For WSOs directly from RTU courses, the average time from arrival on station until fully qualified and combat ready is approximately 72 days or 2.4 months.[10] If all crewmembers came from UNT/RTU, they would only average 8.1 months of their tour in combat ready status. On remote assignments, however, 50 percent assigned are fully qualified from prior combat units and require only a local area checkout in order to be fully qualified.[11] Assuming a normal rotation in/out of the unit throughout the 12-month period, and that a balanced rotation of experienced and inexperienced WSOs is maintained, the average number of months in fully qualified status is 9.3 months. Therefore 1.2 months for the average WSO is in training status. The 1.2-month noncombat qualified time applied against the 10.5-month normal aircrew utilization period means that only 88.6 percent of the WSOs at any one time are fully qualified.

Figure 6 graphically depicts the increase in the percentage of fully qualified WSOs as top-off training is reduced. If no training was required on arrival, WSOs would average 10.5 months fully qualified. As the program now stands, 88.6 percent are normally fully qualified at any one time. If the newly arrived RTU graduates possessed increased proficiency to the degree that 25 percent of the training could be eliminated, the average number of fully qualified WSOs would increase from 88.6 percent to 91.5 percent. This represents a signficant increase in readiness as it applies to the Readiness Reporting System.

Figure 7 depicts the same readiness logic for a long overseas or CONUS tour with appropriate parameters. Because of the longer tour lengths and the fact that upgrade time remains the same, the percentage

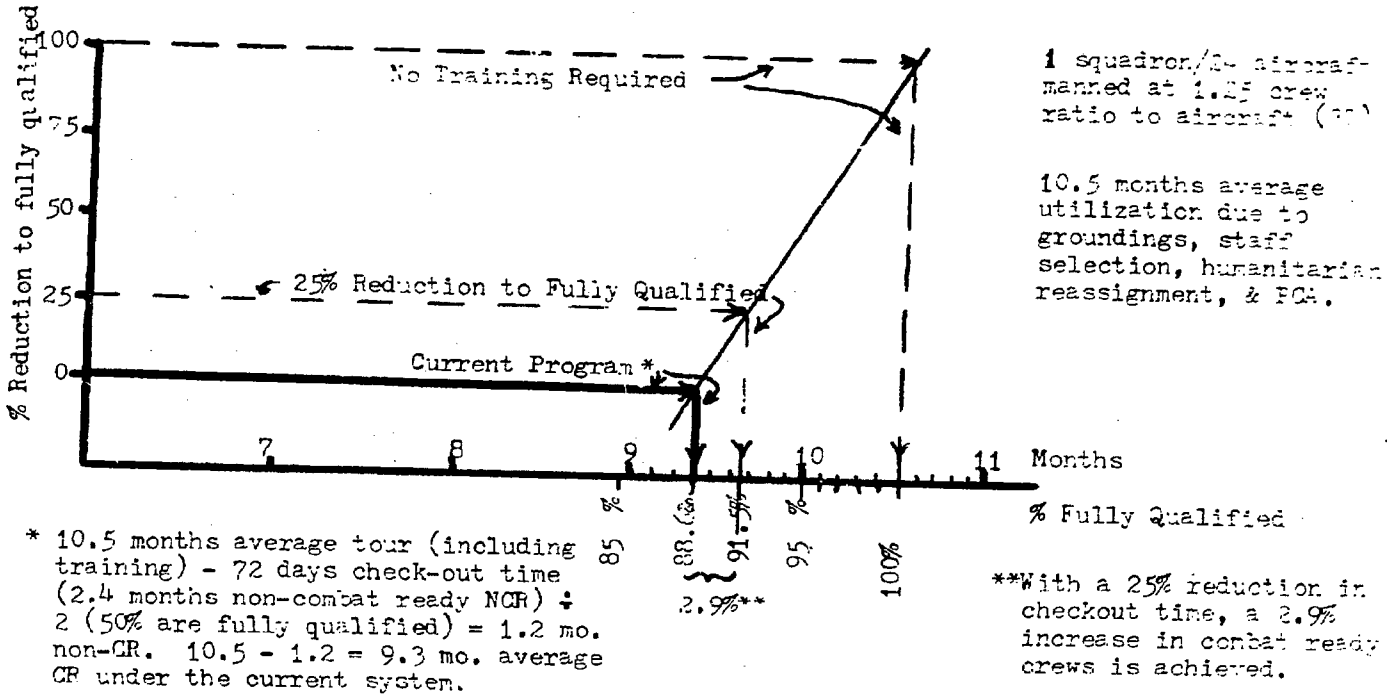


Figure 6. F-4 WSO Readiness, Short Tour

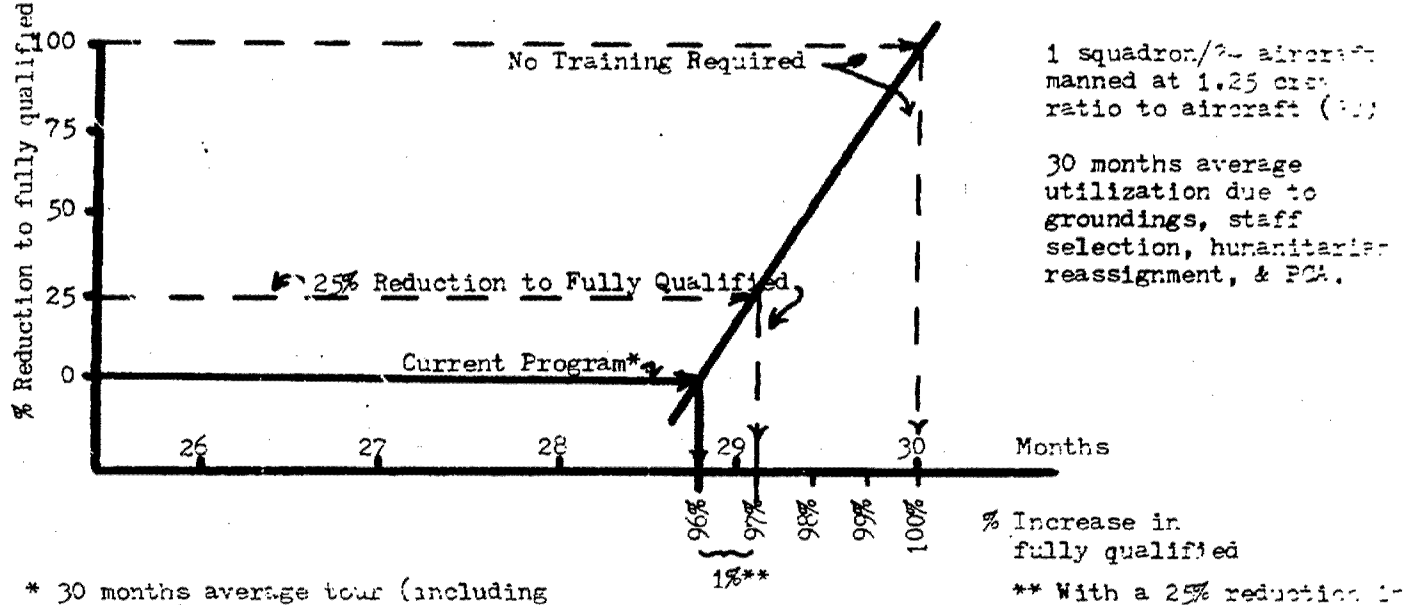


Figure 7. F-4 WSO Readiness, Long Tour

of fully qualified WSOs is greatly increased. A 25 percent reduction in required top-off training results in an increase from 96 percent to 97 percent combat ready. This is significant, but not as dramatically so as the short tour example.

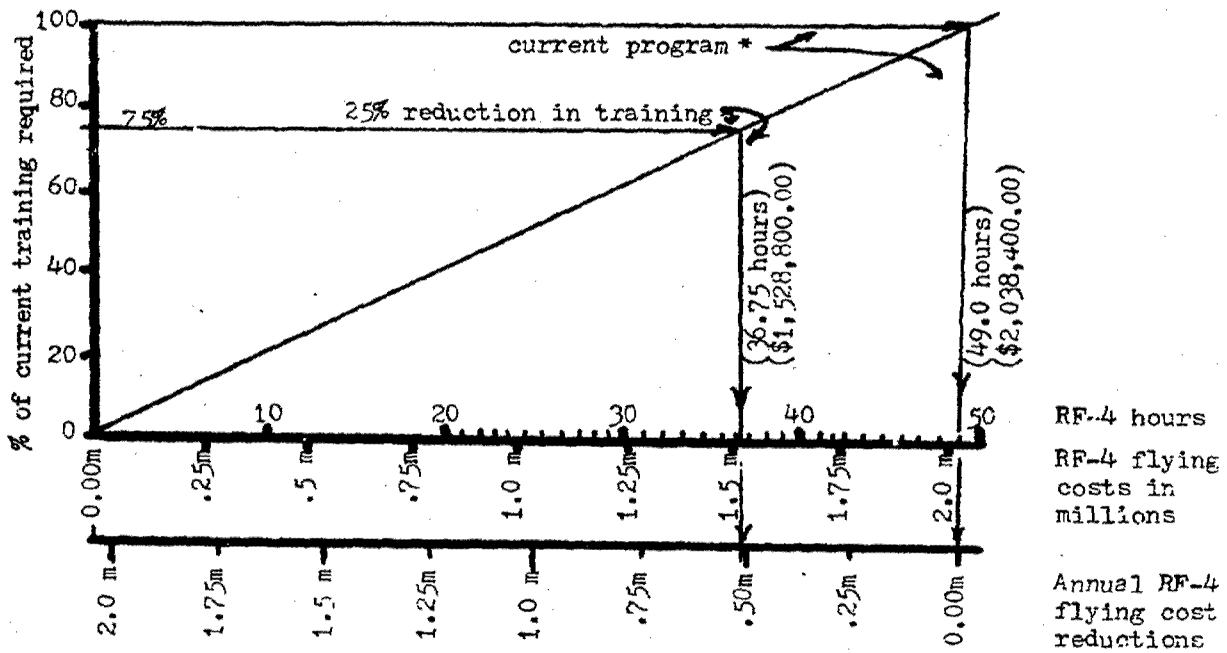
IMPACTS ON RF-4C AND F-111 TRAINING

RF-4C and F-111 training cost analysis becomes less complicated than the F-4 training program because the WSOs graduating from these RTUs are fully qualified and all training, less the local area checkout, is accomplished in RTU status. Consequently, all savings in sorties to fully qualified status would be realized in the RTU programs. Nevertheless, the benefits become significant.

RF-4C RTU flying costs are currently $2,038,400.00 to upgrade all WSOs for FY 1978 and a 25 percent savings would amount to $509,600.00. (figure 8). F-111 RTU flying training costs using the parameters as depicted on figure 9 are currently $11,610,650.00 and a 25 percent reduction in flying requirements would amount to a savings of $2,902,662.50.

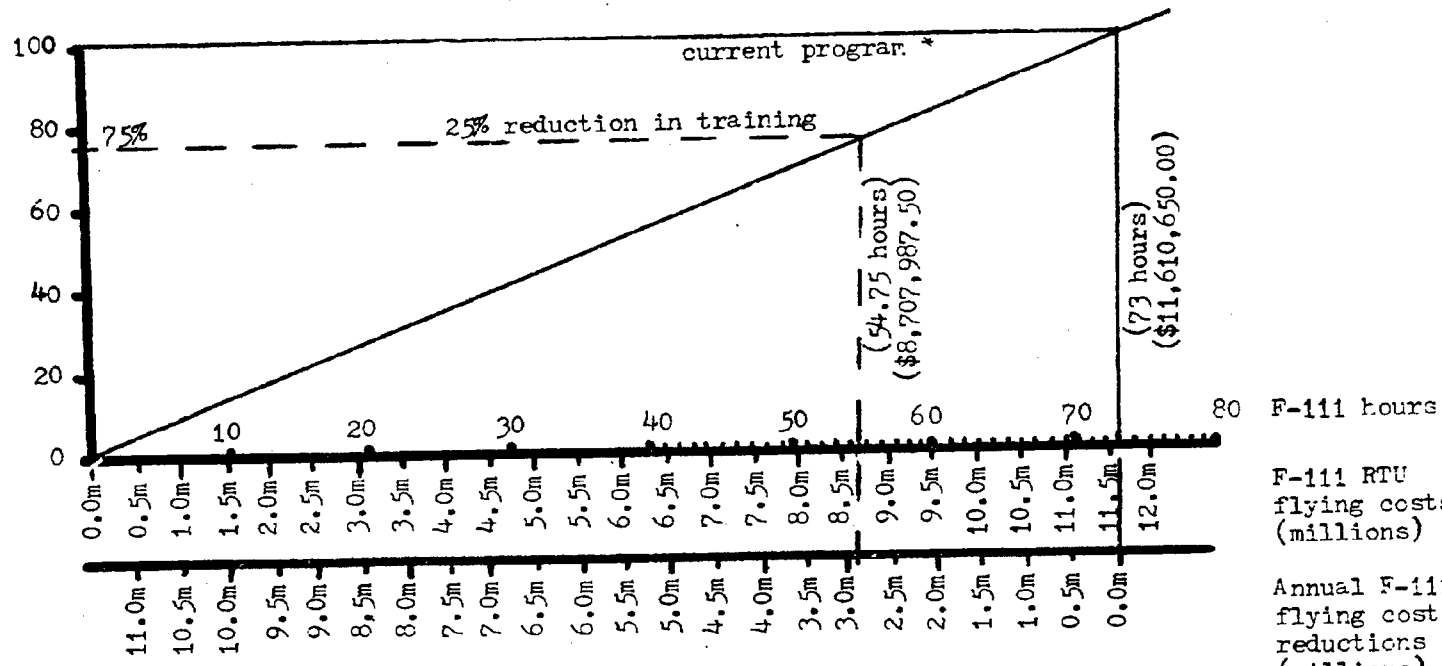
SUMMARY

If we assume that the proposed specialized UNT training program will significantly improve the proficiency of the WSO and this can be related to reduced flying training hours in the various tactical fighter/tactical reconnaissance weapons systems while achieving current proficiency minimums, the potential for monetary savings appears to be most significant. The figures shown in table 6 depict a summary of flying costs, and compares the costs if the program is able to reduce flying training programs by 25 percent.



* Annual RF-4 RTU flying costs based on 20 WSOs X 49 flying hours X $2,080.00/hour RF-4 operating costs.

Figure 8. Annual RF-4 RTU Flying Costs



* Annual F-111 RTU flying costs based on 50 WSOs X 73 flying hours X $3,181.00/hour F-111 operating costs.

Figure 9. Annual F-111 RTU Flying Costs

TABLE 6

SAMPLE FLYING SORTIE COST SAVINGS

	Current RTU Flying Costs	25 Percent Reduction
F-4 RTU	$8,811,999.00	$2,202,999.75
F-4 (in unit)	2,816,950.00	704,237.50
RF-4C RTU	2,038,400.00	509,600.00
F-111 RTU	11,610,650.00	2,902,662.50
TOTAL	$25,277,999.00	$6,319,499.75

Though the potential for savings to the Air Force is significant, the original proposal for specialized training was to enhance the proficiency of new WSOs. If management would decide to reinvest the savings to be achieved through specialized training into continuation training programs, the proficiency of WSOs could be improved far beyond the levels currently considered "minimum standard".

Attendant with this proposal is a potential increase in readiness, depending on how the programs would be managed. F-4 operational wings would have a greater proportion of WSOs in combat ready status and perhaps more significantly, assets now used for RTU training might be freed for use in operational units. This would increase the combat capability of tactical fighter and tactical reconnaissance forces.

CHAPTER 4

FOOTNOTES

[1]Roger E. Rosenberg, Captain, USAF, telephone inquiry to the Weapons Systems Officer Resource Management Section, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 19 September 1977.

[2]Nolan W. Schmidt, Major, USAF, Chief of Weapons Systems Officer Resource Management, briefing to the Chief of Rated Assignments, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 16 May 1977.

[3]Ibid.

[4]Ibid.

[5]Directorate of Navigator Training, Headquarters, Air Training Command, "Comparison of Current and Specialized Navigator Training Programs," DAF, HQ ATC, Randolph AFB, Texas, 22 March 1976.

[6]Terrence M. Murphy, Major, USAF, HQ TAC/DOXS, briefing to the USAF/TAC/ATC/MPC WSO Course Proposal Conference, Mather AFB, California, 18 May 1977.

[7]Terrence M. Murphy, Major, USAF, HQ TAC/DOXS, telephone inquiry, Luke AFB, Arizona, 19 December 1977.

[8]Ibid.

[9]Nolan W. Schmidt, Major, USAF, Chief of Weapons Systems Officer Resource Management, briefing to the Chief of Rated Assignments, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 16 May 1977.

[10]Ibid.

[11]Ibid.

CHAPTER 5

PERSONNEL ISSUES

INTRODUCTION

On the surface it would appear that the benefits to be derived from specialized WSO training would outweigh any adverse impacts the program might incur. The potential for monetary savings appears substantial, the prospects for increases in readiness appear significant, and an increase in WSO capability through concentrated training in specific WSO skills rather than general navigation training appears to be a rational concept. There remain additional issues, however, that must be considered before implementing any forms of specialized training.

As in any Air Force career field, adjustments occasionally occur in navigator personnel requirements. When these changes transpire at predictable rates with ample "lead time", simple adjustments in UNT production usually accommodate these changes without employing special manning actions. Occasionally, however, unprogrammed adjustments in weapons systems inventories, ratio of air crew to aircraft, or changes in staff requirements are of either such a magnitude or time sensitive that simple adjustments in UNT production are insufficient to accommodate the change to requirements and special manning actions have to be taken. In the past these adjustments (in addition to UNT flow adjustments) have included withdrawing navigators or WSOs from rated supplement duty and placing them into the short-manned positions, and/or cross training navigators from favorably manned systems to the ones experiencing air

crew shortages.[1] With navigators trained in a general navigator training program, graduated as universally assignable, these management options remained viable. When UNT production is partitioned by specialized training, new constraints on navigator utilization are surfaced.

CROSS TRAINING

The largest single issue to be adversely affected by specialized training is the potential problem of cross training between weapons systems worlds. Presently, universally assignable navigators can theoretically be assigned from one weapons system world to another with RTU training only.[2] It has often been a subject of debate as to exactly how much training a WSO with, say, ten years of WSO experience and no classic navigation experience needs in order to upgrade into combat ready status in classic navigation duties, but the concept of cross training is considered viable. Navigators trained under the proposed specialized training program would no longer be able to be reassigned between WSO duties and classic navigator duties without either returning to an ATC training course which would qualify them in the skills not taught in the specialized program, or they would have to be trained in these skills in the RTU of the gaining Command.

Cross training between weapon systems worlds is currently used as a "last resort" manning action to balance manning between weapons systems. UNT flow adjustments and rated supplement withdrawal actions are usually initiated before resorting to cross training due to several reasons, one of the most important being training expense.[3] In this age of tight fiscal management, it is most difficult to justify training a navigator in one weapons system only to later expend training resources on him to qualify him in yet another weapons system. Not only are training resources expended,

valuable experience in a weapons system world is also lost. Within weapons systems worlds, however, cross training is not uncommon in order to promote assignment equity. For example, the F-4 is currently the only weapons system requiring WSOs that is based in short tour (remote) areas. In order to promote assignment equity, WSOs from F-111s can be "tapped" to serve in F-4s to satisfy a remote requirement and F-4 WSOs who have completed remote tours are sometimes reassigned to F-111s as a backfill action. Since both of these systems are of the same weapons system world, and experience is considered "transferrable" by Rated Distribution and Training Management (RDTM) methodology, the only training required is conversion training (training in the performance parameters, aircraft systems, and unique operating techniques of the other weapons system). It is not normally consistent under current policy to randomly assign an F-4 WSO to KC-135s or B-52s, a needless reassignment to a totally different weapons system world.

An exception to this policy is currently being employed to reduce the manning in C-130s and C-141s which have recently received reductions in navigator requirements.[4] Limited numbers of these navigators are being assigned to WSO duty rather than to totally orient the UNT flow to fighter systems. This decision was taken, not only to increase WSO manning in F-4s and F-111s, but to also balance the rank structure as well. It would have been possible to restructure the UNT flow to accommodate the change by stopping all UNT inputs to the C-130 and C-141 aircraft and assigning the navigators to WSO duty; however, this action would have resulted in an imbalance of second lieutenants in fighters and an increasingly aged navigator force in C-130s and C-141s. Though this action is an exception to normal navigator resource management, it does point out the fact that cross training does occasionally occur between weapons

systems worlds. It must be emphasized that this exception was not the only alternative, but was chosen to balance rank structures as well as equalize manning imbalances.

To place the cross training problem into perspective, it is necessary to review the historical cross training trends both into and out of the WSO force. Table 7 depicts both the flow from the WSO force to classic navigator duties and from those classic functions to the WSO force by fiscal year for the last five years.[5]

TABLE 7

HISTORICAL CROSS TRAINING FLOW

Fiscal Year	WSOs to Classic Duties*	Classic to WSO Duties
1973	20	72
1974	18	84
1975	9	93
1976	3	77
1977	3	162

*These figures do not include WSOs who were assigned to ATC instructor duty.

These figures demonstrate that approximately 90 percent of navigators cross trained were from classic functions to WSO duties and as the figures become chronologically more current, the ratio becomes more exaggerated toward WSO conversion. In the FY 1973 through 1975 figures, the cross training was primarily due to reductions in B-52 requirements, losses in support aircraft requirements, and deactivation of C-130 and KC-135 units as some of these aircraft were transferred to the Air National Guard. In more recent years, the trend to WSO duties was the result of navigator and WSO production being reduced in anticipation of the loss of

F-4 requirements. Numbers of F-4s were to be reassigned to the Air National Guard in conjunction with a transition to greater numbers of single-seat fighter aircraft. Contrary to this plan, most of these F-4s scheduled for the turnover remained on active duty and increased numbers of navigators had to be cross trained to meet the anticipated WSO shortages that in fact developed.[6]

There remains the possibility that the necessity of cross training navigators to WSO duty will continue. WSOs are currently being produced at a rate less than that required to sustain the current force. Production is geared to an anticipated loss of F-4 requirements, and when F-4s are withdrawn from the active inventory the surplus F-4 WSOs are scheduled to be transitioned to F-111 billets, thereby preventing a surplus inventory of WSOs and retaining the F-4 WSO experience in the fighter weapons systems world.[7] Should the Air Force reduce the rate of F-4 turnovers to the Guard, or determine that some variants of the A-10, F-15, or F-16 become two-place fighters requiring WSOs, the WSO force will become even more short-manned and special manning actions (such as cross training from other weapons systems worlds) may be necessary.

Though not a likelihood, there also remains the possibility that at some future time some WSOs might have to be cross trained to classic navigator duties. Should this eventuality ever occur and specialized training be implemented, the flexibility of the universally assignable navigator would be lost and these navigators would have to be taught classic navigation skills. MAC and SAC, the principle users of classic navigators, would likely not be receptive to the idea of assuming the training burden to qualify these navigators in classic skills, though the training burden will likely not be much increased over that which would be required today if a navigator with ten years of WSO experience

and no classic navigation experience except INT were required to cross train.

A possible solution for this training problem would be for ATC to develop a cross training program to facilitate weapons system world conversion. The aircraft assets would be available from the resources saved from the WSO portion of specialized training, and ATC has already announced the capability of accomplishing this cross training based on a program similar to the "reblueing" program employed to requalify repatriated prisoners of war after the Southeast Asian conflict.[8] It is conceivable that such an ATC program, using training aircraft instead of the more expensive to operate operational counterparts, might even requalify current universally assignable WSOs into classic navigator duties at less expense than is currently expended in SAC and MAC training programs. Though ATC maintains that this concept is feasible,[9] further study should be initiated to determine actual expenses involved and resources required.

To summarize the cross training problem, it would appear that the necessity for cross training may continue, or, under certain circumstances, increase. If we base the cross training trend on past history and the potential for adjustments due to weapons systems inventories, it seems likely that cross training will continue to be primarily from the navigator requirements to the fighter requirements, creating a predominantly one-way flow to WSO duties. In the event that specialized training is implemented, it would remain necessary for TAC to retain a transition course for navigators cross training to WSO duty similar to the course in effect today.

UNT DISTRIBUTION FLEXIBILITY

Another issue which must be considered in the personnel management aspects of implementing a specialized training program involves UNT distribution flexibility. Under the current system of graduating universally assignable navigators, navigator resource managers have the ability to make last-minute changes in UNT distribution to satisfy short notice changes in requirements. Theoretically, it is possible on the last day of the UNT program to assign an entire graduating class to any one particular weapons system. This flexibility would be lost because the graduating navigators would only be qualified to serve in either the WSO words, or classic navigator functions. In practice, however, the extreme case of assigning an entire class to one weapons system is not feasible as UNT graduation must be balanced to meet the training capabilities of the weapons system to which the graduates will be assigned.

The number of UNT graduates that can be scheduled for F-4 RIU, for example, are governed by the amount of training TAC can provide in the way of T-38 Lead-in Training (LIT) and Replacement Training Unit (RTU) courses. Whereas it may be possible to assign an entire graduating class to the F-4, TAC assets are only capable of training a finite number of RTOs based on the training "slots" and aircraft assets available to provide continuation training. Therefore, gross surges from the UNT pipeline to individual weapons systems RTUs, though theoretically possible from the UNT distribution standpoint, are not practical from an absorption viewpoint, hence the advantage of this "flexibility" is diminished.

Current UNT distribution is also based on an attempt to balance initial flying assignments to approximate a representative cross-section of the total navigator requirements in the Air Force. If the fighter requirements are, for example, 30 percent of the total navigator

requirement, an attempt is made to provide approximately that percentage [illegible] requirements to each graduating class. This is done in the interests of "career enhancement/assignment satisfaction" to offer a balance of duties so that post-UNT assignment preferences can be accommodated to the maximum extent possible.

Post-UNT assignments are currently made approximately two months prior to graduation.[10] Under a specialized program the post-UNT weapons system world would have to be determined approximately four months prior to graduation in order to place the student into the proper "track." The post-UNT assignment process as far as individual weapons system world is concerned would have to be determined approximately 60 days prior to the time the determination is made under the current system, a negligible impact because it generally takes more time than that for the Commands to acquire assets (training aircraft, instructors, and associated facilities and equipment) to appreciably increase the upgrade capability. Actual aircraft of assignment decisions would not have to be determined any sooner than is done under the current UNT program, approximately 60 days prior to graduation.

CHAPTER 5

FOOTNOTES

[1]Roger A. Rosenberg, Captain, USAF, telephone inquiry to the Weapons Systems Officer Resource Management Section, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, 19 September 1977.

[2]Ibid.

[3]Ibid.

[4]Ibid.

[5]Nolan W. Schmidt, Major, USAF, as Chief of Weapons Systems Officer Resource Management, Headquarters, Air Force Military Personnel Center, Randolph AFB, Texas, records in the possession of the author.

[6]Nolan W. Schmidt, Major, USAF, as Chief of Weapons Systems Officer Resource Management, Headquarters, Air Force Military Personnel Center, briefing to Chief of Rated Assignments, 16 May 1977, Randolph AFB, Texas.

[7]Ibid.

[8]Gerald S. Vananzi, Major, USAF, 232 FTS/DOTM, briefing to the USAF/TAC/ATC/MPC T-38 Course Proposal Conference, Mather AFB, California, 18 May 1977.

[9]Ibid.

[10]Harry A. Westerfield, T/Sgt, USAF, telephone inquiry to the Training Pipeline Management Division, Headquarters, Air Force Military Personnel Center, 14 September 1977.

CHAPTER 6

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

Specialized training for the WSO segment of the navigator resource is not a new proposal, but renewed interest in this concept has been generated as a result of recent official Air Force studies which have been highly critical of the training and capabilities of WSO graduates of the current training programs. The AFISC FMI report and the Corona Aces study have intimated that the current program of training navigators who are universally assignable throughout all segments of the navigator force does not train WSOs to the desired level of competence and 50 percent of the training that WSOs do receive is wasted because it prepares them in skills which will never be used in the accomplishment of WSO duties.

During the last five years, ATC conducted numerous studies which repeatedly addressed this problem, and several proposals recommending a separate WSO training program, geared to the unique requirements of WSO duty, have been forwarded to the Air Staff for consideration. The Air Staff response to date has consistently been one of apprehension toward any training program which departs from the universally assignable aspect of aircrew training and management. The aforementioned reports and studies have, however, served to point out deficiencies of the current program to the degree that the commanders of ATC and TAC have directed a re-examination of the specialized training concept. As a result of this renewed interest, ATC has recommended a new specialized WSO training

program, the subject of this treatise.

The gist of this proposed training program is simply to separate WSOs from the current UPT training program at the point where they would begin blocks of training which have no application to WSO duties, and from that point on, substitute courses of instruction specifically oriented to developing skills that they will need in performing as operational WSOs. ATC studies and the Functional Management Inspection report agree that approximately 50 percent of the training that WSOs now receive has no application in the performance of WSO duties. The proposed program would eliminate the 50 percent of training that is not applicable to the WSO and, in turn, reinvest the time and assets into concentrated WSO-related training, thereby producing a better qualified, more knowledgeable, and advanced WSO graduate from UPT.

TAC would then receive this newly graduated WSO and, because of his advanced state of proficiency, would concentrate on developing him in advanced WSO skills. Because TAC receives a more proficient graduate who will already have a firm foundation in WSO skills, they would have two management alternatives in respect to continuation training. Since the gained WSO is more proficient and would require less RTU sorties to meet current RTU graduation proficiency levels, TAC can reduce RTU training and reinvest RTU training resources into operational assets, or TAC can maintain the RTU training course length much as it is today, and reduce the continuation training burden of the operational units.

Studies of the costs of the proposed UPT portion of the specialized WSO training program have been accomplished. Using current WSO production costs as a base for comparing the expense involved in the proposed specialized program which utilizes the less expensive to operate T-37 aircraft rather than the current predominantly T-38 oriented flying

training program, an estimated annual savings of $1,503,336.70 would be achieved.

After TAC receives the product of the specialized program, less training time would be required to bring the WSO to current levels of proficiency. If this product were to require 25 percent less flying time in upgrade training under current TAC programs, the annual savings to TAC and Tactical Air Forces (TAF) in general would be $6,319,499.75. Since the impetus behind this program is to produce a better qualified WSO rather than a cost savings initiative, TAC would, in effect, be able to reinvest this savings in training which would bring the level of proficiency of WSOs far beyond that of today's graduates of the UNT/RTU pipeline.

As a readiness initiative, the specialized training proposal offers two distinct advantages. Should TAC decide to graduate the RTU students at the current levels of proficiency, the flying time saved by the graduates of the specialized program would allow portions of the RTU training fleet to be released for operational duty, or be assigned to Air National Guard modernization programs. If, on the other hand, RTU training courses were continued at their current lengths, less in-unit post-RTU training would be required as the operational units would be receiving more proficient WSOs. This, in turn, means less sorties generated for training which translates into achieving combat ready status in less time. The cumulative results would be increased percentages of operational aircrews being combat ready, which becomes particularly significant in short tour areas.

The cross training issues will remain significant considerations in the propriety of adopting the specialized training program. As analyzed from a historical perspective, cross training has been, and is likely to

continue to be, predominantly from the classic navigator worlds to the WSO force. This trend has steadily increased during the last five years. Still, there is a potential that at some future time some WSOs would have to be cross trained to classic functions. This is an issue which would not have an immediate impact due to the fact that if the specialized program was implemented today, all WSOs produced before specialized training began would still be universally assignable.

It would be prudent, however, to plan for this contingency by examining the feasibility of developing an on-the-shelf cross training program for teaching those skills which specialized training would eliminate from the WSO track. Indeed, if this cross training requirement should exist, a training program geared to training the current WSOs in celestial, grid, loran, pressure pattern, and other forms of classic navigation should be "on the shelf" and implemented as required to reduce the training load on MAC and SAC even if specialized training were not adopted. It has been estimated that a cross training program such as this could qualify experienced WSOs in classic navigator duties in less than two months and in under 15 T-43 sorties. T-43 sortie rates would likely not increase significantly as the cross training students would be sharing T-43 training sorties with UNT students.[1] Such a cross training program should be developed as an item for further study whether or not specialized UNT programs are adopted. Additionally, since historically the cross flow has been to the WSO force, it would remain essential for TAC to continue conversion course programs similar to those used today, for cross training classic navigators to WSO duties.

In regard to UNT distribution, the impacts of specialized WSO training would be minimal. Force structure changes have not, historically, been of such a magnitude as to significantly require gross UNT

distribution adjustments, nor are these changes likely to have a significant effect in the future. Weapons system absorption is governed by the training programs of the various weapons systems and remain relatively inflexible due to the amount of resources required.

CONCLUSIONS

The concept of improving UNT/WSO graduate capabilities by eliminating training which has no application to future skill requirements and substituting courses and training blocks specifically designed to train WSOs in the skills required in the gaining operational weapons system world is sound. Moreover, the program, as outlined by ATC, would likely result in UNT production costs savings.

By receiving a more proficient WSO for continuation training, TAC would realize significant savings in training costs and training assets in bringing the student WSOs up to current proficiency standards. TAC could then reinvest these assets into continuation training programs in order to raise the level of WSO proficiency beyond that achieved under the current training program.

The major obstacle remains one of navigator resource utilization constraints. In light of historical trends and the indicia of future trends, it appears that this constraint is overshadowed by the potential gains that specialized training offers. Nevertheless, it appears necessary for an ATC-developed cross training program to be structured and thoroughly analyzed to include total cost analyses and studies of ATC's capability to implement the program within the capability of current resource constraints. This is an item requiring further study and the ATC cross training program may well have future application despite the outcome of the specialized training proposal.

RECOMMENDATIONS

To proffer a definitive recommendation on the specialized training proposal, it is necessary to insure that there is an adequate cross training capability within ATC resources. It is recommended, therefore, that a comprehensive study be initiated to determine the feasibility and practicability of such a program. If this program proves feasible and attainable within current resource constraints, the major obstacle to the specialized WSO training proposal is removed and the concept should be adopted.

BENEFITS	COSTS
1. Better WSO training	**1. Less flexibility in Navigator Management
2. Savings of 1,722 T-43 flying hours annually	**2. Less flexibility in UNT Distribution
3. Savings in Replacement Training Unit (RTU) flying time	**3. Possible requirement for cross training
*4. Reduction in operational unit upgrade training flying hours	4. Returning two T-37 aircraft from flyable storage to operational status
*5. Increases in unit readiness	5. Assigning two T-37 Instructor pilots to Mather AFB, California
6. Transferring some RTU training aircraft to operational requirements	
7. More proficient WSOs	

*These factors are dependent on management's decision to either realize all operational training savings in RTU, or to balance the savings between RTU and the operational units.

**These costs would be realized only in the event of extraordinary unanticipated force structure changes.

Figure 10

SUMMARY OF ARGUMENTS

CHAPTER 6

FOOTNOTES

[1]John A. Rogers, Lt Colonel, USAF, telephone inquiry to the Director of Navigator Training, Headquarters, Air Training Command, Randolph AFB, Texas, 16 November 1977.

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY

Aircraft Transition: A program involved with training an experienced rated aircrew member from one weapons system to another.

Air Force Inspection and Safety Center (AFISC): Separate operating agency of the Air Force with overall responsibility for monitoring the Air Force inspection system and safety programs. Helps assure that the Air Force's fighting capability is sustained and effectively managed.

Air Force Military Personnel Center (AFMPC): Separate operating agency of the Air Force, responsible for personnel policies and assignment actions for enlisted and officer personnel below the rank of Colonel.

Air Staff: Headquarters Air Force staff agencies to include the separate operating agencies of the Air Force Military Personnel Center (AFMPC) and the Air Force Inspection and Safety Center (AFISC).

Air Training Command (ATC): Major USAF command charged with the responsibility of providing initial military technical and flying training.

Basic Course Training ("B" Course): The basic post-UNT/UPT graduate training a rated officer receives on his initial operational aircraft check-out. Training not only includes aircraft transition training, but also includes training in the basic tactics and doctrine appropriate to the weapons system world to which the student is assigned.

Celestial Navigation: The plotting of an aircraft's position by means of sightings on celestial bodies. Considered a form of "classic" navigation.

Classic Navigation: Navigation accomplished by traditional means of celestial computations, grid techniques, pressure pattern, loran, radar, dead reckoning (DR), and other navigation aids. This form of navigation is characteristic of that accomplished in bomber, tanker, and airlift missions.

Conversion Course Training ("C" Course): Conversion training into a specific weapons system from another operational weapons system of the same world. "C" Course training involves only that training required to employ the weapons system for which he is being trained and does not normally include the basic procedural doctrinal training for the weapons system world.

Dual Track: The concept of splitting navigator training into two programs, one oriented to classic functions, the other oriented to WSO duties. Alternate term for "specialized training."

Electronic Warfare Officer (EWO): A rated navigator who is also a graduate of Electronic Warfare Training (EWOT). Specifically trained to operate ECM and ECCM equipment and serve in EWO staff positions.

Lead-in Training (LIT): A TAC T-38 training program whereby pilots and navigators are taught basic fighter maneuvers and techniques in T-38 aircraft. LIT precedes RTU or CCTS training in fighter and tactical reconnaissance training programs.

Line Aircrew: A basic aircrew member, either pilot or navigator. Separate from a rated staff officer or supervisor.

Major Command (MAJCOM): One of the Major Air Commands of the Air Force, principally Air Training Command (ATC), Military Airlift Command (MAC), Strategic Air Command (SAC), and Tactical Air Command (TAC).

Pipeline: The route or assignment sequence from basic undergraduate navigator training to fully qualified status in an operational unit. Includes all intermediate PCS or TDY training.

Rated Distribution and Training Management (RDTM): A joint airstaff and MAJCOM working group which is involved with planning, training, and distribution policies of rated officers and determining out-year requirements. Principal participants include: HQ USAF Director of Operations (XOO), Director of Plans (XOX), Director of Personnel Plans (DPX), Director of Personnel Programs (DPP), Directorate of Manpower (PRM), the Air Force Military Personnel Center (AFMPC), Data Services Center, and representatives from Operations and Personnel of each affected MAJCOM.

Rated Distribution and Training Methodology (RDTM Methodology): The distribution formulae for determining weapons systems manning flows within and out of weapons systems. RDTM Methodology defines "fair share" distribution to ATC instructor duty and generalist staff requirements to assure assignment equity and optimum utilization of the rated force.

Rated Duty: Any duty in staff or operational flying functions which, according to AFM 36-1, requires the officer to possess an appropriate aeronautical rating of pilot or navigator.

Rated Force: The officers who possess aeronautical ratings.

Rated Officer: A USAF officer who is a graduate of a formal USAF flight training program and possesses an aeronautical rating of navigator or pilot.

Rated Supplement: Rated officers serving in non-rated or support duties. The rated supplement provides a bank of experienced pilots and navigators to meet operational contingencies should aircrew requirements suddenly be increased.

Replacement Training Unit (RTU): A MAJCOM training unit which provides "B" or "C" course training to pilots and navigators and qualifies them in operational aircraft.

Requirement: Actual or projected vacancy of an authorized officer position within the period of the requirement cycle, not filled from personnel resources available to the activity.

Specialized Training: Training specifically oriented to either classic navigation or WSO duties. Alternate term for "dual track."

Tactical Air Command (TAC): A major USAF Command responsible for training ATC-graduated rated officers in operational tactical aircraft and providing a tactical force for worldwide tactical air operations.

Tactical Air Forces (TAF): Term used to include all USAF commands that possess tactical aircraft including, but not limited to: Tactical Air Command, Pacific Air Forces, Alaskan Air Command, and United States Air Forces, Europe.

Top Off Training: That in-unit training given F-4 aircrews in their operational units to qualify them as "fully combat ready." Top off training is different from continuation training which is in-unit training designed to maintain proficiency and combat ready status.

Undergraduate Navigator Training (UNT): The basic training program which trains officers to perform duties as navigators or WSOs.

Undergraduate Navigator Training System (UNTS): The training system/sequence for navigator training including curricula, instructional methods, flight simulators, and training aircraft.

Weapons System: The total complex of equipment, skills, and techniques which together form an instrument of combat, usually, but not necessarily having an air or space vehicle as its major operational element.

Weapons Systems Officer (WSO): Generic term used to describe navigators who serve in tactical reconnaissance or fighter aircraft. Duties include systems operation, weapons delivery and employment, monitoring flight tactics, accomplishing intercepts, and operation of navigation equipment. The term also includes WSOs who have graduated from EWOT and are serving in WSO functions.

Weapons System World: RDTM term to describe a grouping of weapons systems of similar missions through which cross flows involve only conversion course training (training limited to aircraft systems, operation of the aircraft, and unique employment techniques). Within weapons systems worlds, experience gained in one weapons system is transferrable to other weapons systems in the same world and can be applied to the computations of experience levels within units or Commands.

APPENDIX B

FUNCTIONAL MANAGEMENT INSPECTION STATEMENT

(Statement of Fact from the Functional Management Inspection of Tactical Air Forces Aircrew Training PN 77-603, 1 November 1976--15 September 1977)

STATEMENT OF FACT
FROM
FUNCTIONAL MANAGEMENT INSPECTION
of
TACTICAL AIR FORCES AIRCREW TRAINING
PN 77-603
1 November 1976 - 15 September 1977

1. This Statement of Fact only covers those portions of the report pertinent to navigator/weapon systems officer (WSO) training.

2. From Part I (Summary) of the report:

a. Undergraduate navigator training (UNT) was neither providing the necessary skills nor developing the psychological attitudes necessary to be effective in the fighter crew force. UNT graduate deficiencies were aggravated upon entry into fighter lead-in training and replacement training unit programs. These programs are heavily pilot oriented, and weapon system officer training was a fallout of what the pilot received. There were no check rides in certain critical phases of training. Most weapons systems officers interviewed were unhappy and demotivated. It can take the weapon system officer up to 2 years of operational duty to acquire the skills he should have been taught in training. Most of this learning is done on his own because no formal program exists to help him.

ACTIONS UNDERWAY

b. ATC response was excellent, and plans are underway to specialize navigator training. TAC established a training team which devised a 24-sortie, weapon system officer fighter lead-in course to precede a 25-sortie WSO-dedicated F-4 training course to be implemented 1 October 1977.

3. From Part II (Findings) of the report:

a. UNT graduates lack the professional skills required to be effective in the fighter crew force. Most skills taught in UNT are not used in fighter aircraft. More importantly, the psychological attitude needed to be effective in the fighter force is not sought out, nurtured, or developed in UNT or in the small portions of the fighter training programs that are devoted to navigators.

(1) The most serious deficiencies of UNT graduates entering fighters are in the areas of : 1) basic airmanship

and situation awareness; 2) basic aerodynamics and aircraft systems; 3) basic instrument procedures; 4) crew coordination and acceptance of responsibility; 5) use of flight publications, approach charts, checklists, dash 1; 6) aggressive attitude and self-assurance.

(2) Deficiencies in a navigator's training are aggravated upon entry into fighter lead-in training (FLIT) and replacement training unit (RTU) programs now in existence. At fighter lead-in training, the prospective weapon system officer is far behind his pilot contemporary. To gain proficiency in his new job, he must, on his own, learn the required basic airmanship skills.

b. In FLIT, the young WSO learns how to use his life support equipment and becomes familiar with fighter maneuvers. Since the FLIT program is pilot oriented, the WSO has little to do. Learning objectives and training standards for the WSO in the airborne phases are poorly defined and almost entirely left to the discretion of the instructor pilot. There is no check ride. The result of this program--arrived at after many interviews with WSOs--is a student with low morale who is unhappy and demotivated.

c. The WSO also lags his pilot contemporary when he enters RTU. This program is also heavily pilot oriented. Only 20 percent of the sorties flown by the student WSO are dedicated to his type of specialized training. His training is basically a fallout of what the pilot receives. The most serious complaint from operational units concerning WSO graduates has been their intercept performance. WSOs in RTUs do not get checked on this because it doesn't phase properly with any checks the student pilots are required to get.

d. These deficiencies in training put the new WSO entering the operational crew force far behind a contemporary pilot. Depending on other factors, it can take the new WSO up to 2 years in the operational force to acquire the professional skills needed to bring his capability up to the level he should have been when he entered the force. There are no formal programs in the operational commands to help the new WSO learn the material he should already have known. He is forced to do it on his own in his spare time.

e. This lack of realistic and properly prioritized WSO training impacts heavily on combat effectiveness and further compounds the existing training problems of the tactical air forces.

f. The universally assignable graduate navigator concept has caused some of the problems mentioned. In the past, the more numerous highly qualified pilots in the operational force had been able to mask the problems until the WSOs became proficient. Additionally, a lack of sufficient feedback from TAF units to ATC and TAC caused the problems to be unrecognized and uncorrected until the low experience levels of most TAF pilots highlighted the need for a better trained backseater.

ACTIONS TO DATE

j. ATC response was enthusiastic, and plans are well underway to develop the necessary program. TAC has very recently established a 24-sortie WSO fighter lead-in course to precede a 25-sortie WSO specialized F-4 training course to be implemented on 1 October 1977 to meet this training shortfall in expanded fighter lead-in training (EFLIT) and RTUs.

APPENDIX C

LETTER FROM GENERAL ROBERTS TO GENERAL DIXON

(Letter from the Commander of ATC to the Commander of TAC convening a conference to construct an improved WSO training program.)

74

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR TRAINING COMMAND
RANDOLPH AIR FORCE BASE, TEXAS 78150

11 APR 1977

General Robert J. Dixon
Commander
Tactical Air Command
Langley AFB, Virginia 23665

Dear General Dixon

As a result of preliminary findings from Corona Ace and subsequent discussions between your staff and mine, I believe our combined efforts are necessary to fully resolve the training needs of the Weapon Systems Officer (WSO).

To this end, we propose to host a working group meeting at Mather AFB with appropriate members of your staff to develop a WSO program that will provide you with a UNT graduate that is specifically tailored to your requirements. We believe that our mutual efforts could result in a responsive course refinement ready for test implementation on 1 July 1977.

Our project officer for this effort is Lt Colonel John A. Rogers, Chief, Navigator Training Division, Autovon 487-3290.

Sincerely

JOHN W. ROBERTS
General, USAF
Commander

APPENDIX D

UNDERGRADUATE NAVIGATOR TRAINING SYLLABUS

(Syllabus of Instruction for Undergraduate Navigator Training, ATC Syllabus N-V6A-D, February 1977)

Syllabus of Instruction for Undergraduate Navigator Training

ATC Syllabus N-V6A-D

February 1977

	Hours
1. Academic Training:	
a. Aerospace Physiology/Life Support:	42
b. Airmanship:	
(1) Flight Safety	2
(2) Flight Regulations, Publications, and Procedures	18
(3) Flight Instruments	2
(4) Dead Reckoning (DR)	2
(5) Visual Navigation	5
(6) Navigation Aids Identification	1
(7) Examination and Critique	3
Total	33
c. Advanced Airmanship:	
(1) Flight Publications	4
(2) Departure, En Route, Airway, and Arrival Procedures	10
(3) Aerodynamics of Flight	2
(4) Instruments	3
(5) Communication/Navigation Procedures	5
(6) T-37 Introduction	4
(7) Examination and Critique	3
Total	31
d. Navigation Procedures:	
(1) Dead Reckoning Computer	11
(2) Flight Planning and DR Procedures	26
(3) T-43 Navigation Systems	6
(4) Celestial Heading Determination	10
(5) Navigation Procedures Laboratory (NPL) Planning, Missions, and Critiques	16
(6) Technical Order System	1
(7) Examinations, NPL Check Mission, and Critiques	8
Total	78
e. Navigation Systems:	
(1) Radar	14
(2) Navigation Computer System	6
(3) Inertial Navigation System	5
(4) Systems Integration	5
(5) Checklist Procedures	3
(6) Astro Navigation Set	1
(7) Airborne Radar Approach	3
(8) Examination and Critique	2
Total	39

Academic Training (continued)

		Hours
f. Aircraft Systems:		
(1) Systems		3
(2) Emergency Procedures (T-43)		2
(3) Aircraft Orientation (T-43)		2
	Total	7
g. Day Celestial Navigation:		
(1) Celestial Theory		3
(2) Precomputations and Plotting		12
(3) Celestial Ground Missions		7
(4) Sextant Shooting		4
(5) Examination and Critique		3
	Total	29
h. Night Celestial Navigation:		
(1) Precomputations		7
(2) Star Identification		4
(3) Sextant Shooting		6
(4) Ground Mission and Procedures		5
(5) Examination and Critique		4
	Total	26
i. Global Navigation:		
(1) Hyperbolic Systems		6
(2) Equipment		7
(3) Regulations		4
(4) Procedures		11
(5) Examination and Critique		3
	Total	31
j. Grid Navigation:		
(1) Charts		4
(2) Gyro Steering		3
(3) Systems Operation		8
(4) Examination and Critique		2
	Total	17
k. Low Level:		
(1) Chart Preparation		4
(2) Flight Planning		4
(3) In-Flight Procedures and Positioning		6
(4) Route Analysis		2
	Total	16

Academic Training (continued)

		Hours
l.	**Operational Procedures:**	
	(1) Rendezvous and Intercepts	3
	(2) Weapon Delivery	2
	(3) CARP and Aerial Delivery	2
	(4) Missions and Equipment	2
	Total	9
m.	**Electronic Warfare:**	
	(1) Hostile Air Defense Systems	3
	(2) Radar Warning Receivers	2
	(3) ECM and ECCM	4
	Total	9
n.	Weather:	
	(1) Charts, Forms, Fronts, and Wind	5
	(2) Systems and Hazards	4
	(3) Pressure and Altimetry	1
	(4) Aviation Weather Reports	2
	Total	12
	TOTAL ACADEMIC HOURS	(382)

2. Trainer/Simulator Training	Missions	Unit Hours	Total Hours
a. T-40:			
Instrument Flying Procedures	2	2	4

b. T-45:	Missions	Approx Hours	Support Hours	Total Hours
(1) Navigation Systems	5	20	18	38
(2) Day Celestial	1	4	4	8
(3) Night Celestial	2	8	8	16
(4) Global	5	20	21	41
(5) Grid	2	8	9	17
(6) Low Level	2	8	8	16
(7) Advanced Low Level	3	12	12	24
(8) Departures and Approaches	1	4	1	5
T-45 Totals	21	84	81	165

3. Flying Training

a. T-37:				
(1) Communication and In-Flight Procedures	1	1.3	5.2	6.5
(2) Dead Reckoning	1	1.3	2.2	3.5
(3) Visual Navigation	2	2.6	7.4	10.0
(4) Unusual Attitudes, Confidence Maneuvers, and Aerobatics	1	1.3	3.2	4.5
T-37 Totals	5	6.5	18.0	24.5

Flying Training (continued)	Missions	Approx Hours	Support Hours	Total Hours
a. T-43:				
(1) Navigation Systems/ Manual and Automatic DR	5	25	18	43
(2) Day Celestial	4	20	15	35
(3) Night Celestial	4	20	15	35
(4) Global	4	20	16	36
(5) Grid Navigation	2	10	8	18
(6) Low Level	2	10	8	18
T-43 Totals	21	105	80	185
TOTAL FLYING	26	111.5	98	209.5

4. Military Training

a. Physical Training		81
b. Processing and Indoctrination		40
c. Career Information		17
	Total	138

APPENDIX E

1974 ATC SPECIALIZED UNT TRAINING PROPOSAL

1 [illegible] 81

The attached material is an outline of the proposal to specialize navigator training. In respect for your busy schedule I have elected to leave the details out and offer only the basic idea. If you are interested in reviewing the entire proposal I will be pleased to send a copy to you.

SPECIALIZATION, A PROPOSAL

A LOOK AT THE PRESENT SYSTEM

Present day navigators are divided into three broad categories: a basic navigator whose major role centers around directly and controlling the movement of airplanes; a bombardier who also navigates, but principally is responsible for the control of airborne weapon delivery systems; and an electronic warfare officer who is associated with navigation, but principally collects, locates, identifies and counters electro magnetic transmissions.

To qualify for the aeronautical rating of navigator and the Air Force Specialty Code (AFSC: 1531) associated with navigation all officers must complete the following training program as prescribed by the UNTS syllabus of instruction.

- UNTS COURSE OUTLINE -

	ACADEMICS	HOURS
a.	Aerospace Physiology/Life Support	38
b.	Basic Systems	31
c.	Basic Procedures	67
d.	Basic Aids	53
e.	Avionics	56
f.	Aircraft Systems	10
g.	Low Level	17
h.	Night Celestial	25
i.	Global Navigation	26
j.	Tactical Navigation	29
k.	Grid Navigation	17
l.	Electronic Warfare	9
m.	Weather	16
	TOTAL	394 Hours

Capt [illegible] from ATC/DONT

SIMULATOR	Support Hours	Actual Simulator Hours
a. Avionics	19	20
b. Low Level	10	8
c. Night Celestial	10	8
d. Global	24	24
e. Grid	10	8
f. Tactical Navigation	14	12
TOTALS:	87	80
TOTAL HOURS:	167	

FLYING

Note: The present program consists of flying training in two trainer airplanes, the T-29 and T-43. Plans are underway to eliminate the twenty year old T-29 in favor of the recently introduced T-43. Details of the flying program as proposed are unavailable at this time. The data listed below is a summary, exact missions are contained in ATC syllabus N V6 A-B, March 1974.

	Actual Hours	Support Hours
a. T-29 Flying (basics)	40	33
b. T-43 Flying (systems)	105	84
TOTALS:	145	117
TOTAL HOURS:	262	

MILITARY TRAINING

a. Physical Training	33
b. Processing & Indoctrination	36
c. Officer Career Planning	20
TOTAL:	89

GRAND TOTAL: 912 Hours (140 Training days, 33 Calendar Weeks)

TABLE 3-1
UNDERGRADUATE NAVIGATOR TRAINING SYSTEM
Course Outline

Further special training to qualify for advanced aeronautical ratings as bombardiers or electronic warfare officers is received by 20% and 15% of the graduates of UNTS. These programs are summarized in Table 3-2.

NBT COURSE OUTLINE	Hours	EWOT COURSE OUTLINE	Hours
a. Academics	229	a. Academics	421
b. Simulator	120	b. Simulator	172
c. Officer Training	49	c. Officer Training	73
TOTALS: (66 Days)	398	(115 Days)	666

TABLE 3-2

OPERATIONAL TRAINING

Only a certain number of tasks in the operational commands are common to all navigation jobs. Many tasks are common only to specific Air Force specialties. The high level of sophistication and complexity leads to the requirement for additional training at the Air Training Command schools at Mather AFB in follow on courses. Further training follows in combat crew training conducted by the using command. Beyond that comes the final local training that qualifies the navigator as an operationally qualified specialist.

The model depicted in Figure 3-3 illustrates the typical flow from entry as a candidate, to qualification as it presently exists:

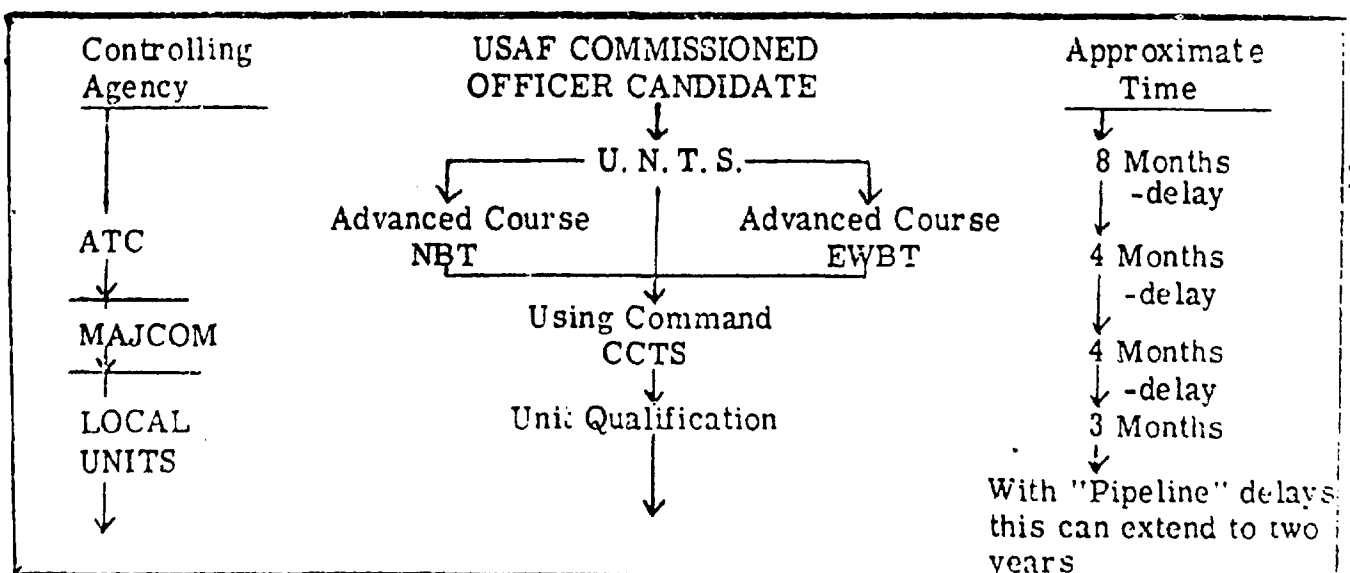


FIGURE 3-3: MISSION QUALIFIED

Two observations are apparent when one studies this model. First, the time line, although depicted in its maximum, is very expensive with respect to time; second, as more and more organizations enter the training picture one quickly sees an opportunity for excessive redundancy to creep in at all levels.

There is little question that expanding the responsibility for training to several agencies dilutes the control and effectiveness of standardized training as is available within Air Training Command (ATC). Recently ATC implemented the systems approach to training, a process called Instructional Systems Development (ISD). In a May 1963 research study at the Air Command and Staff College, Major Francis X. Doyle shows how ISD is used to carefully analyze training requirements and translates these requirements into specific courses of instruction for ATC. Further, his study identifies certain weaknesses and deficiencies in the current operational command directed courses along with pointing out serious training deficiencies. His study outlines the expansion capabilities of ATC with its associated advantages. His paper also analyzes the type of training that is needed is specific specialized training to utilize resources more efficiently and also improve trainee quality.

Major Doyle's insight to the requirements of future training in the school of navigation and his suggestions were based on the implementation of the March 1971 syllabus. His timely and keen appraisal is taken one step further in the proposal that follows.

SHORT COURSE SPECIALIZED TRAINING

It must be emphasized at this point that the following proposal represents an EXAMPLE of how the short course specialized program would evolve. It is difficult to prepare a radical departure from the present course and training plan with the aid of course development specialists and the vast resources of the ATC Instructional Systems Development process. This model is therefore proposed as a challenge and acts as a vehicle to germinate the proposal as a whole:

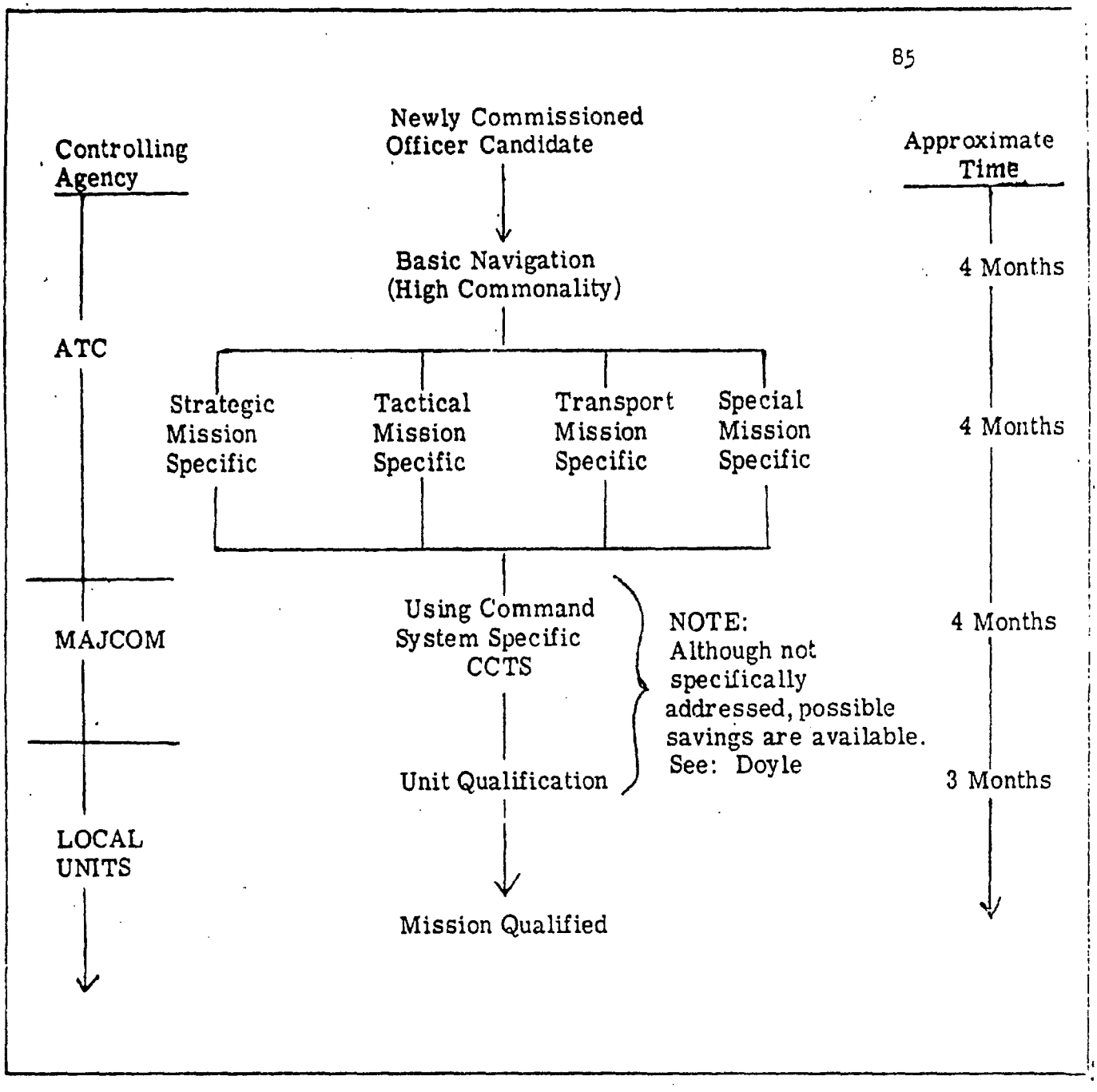


FIGURE 3-4
OPERATIONAL TRAINING FLOW
(PROPOSED)

Once again two characteristics appear, as before; first, the time line is reduced by four months. An important part of this savings is that the aeronautical rating of navigator is awarded further down the training pipeline, thus effecting a savings in useable time to the field. Note, however the rating is still awarded at nearly the same chronological time in the student's frame of reference. Second, the only thing eliminated is that training not germane to his eventual assignment.

Here is how the system would operate: Navigator Candidates enter undergraduate training from the various sources as presently established. Classes would continue to enter UNTS every two or three weeks as they do now. The first part of the training would be the high commonality courses which all students must take. Near the end of this portion of training, the class would be divided into the four mission areas. From then on, each section of students would follow the training for a specific mission. A selection process similar to the one employed presently would determine which area of specialization would be available for each student. This method of specialization expedites the flow of navigator training in a number of ways. First, it eliminates unnecessary theory and application courses which some navigators will not be using in operations. Second, it decreases time spent in UNTS because fewer courses will be required for specialization. Third, it will decrease time required in Combat Crew Training School (CCTS) and in local training because specific operational systems can be taught instead of just general systems. Upon completion of UNTS, a navigator would still have his five-year commitment, but he will be spending more of this time as a qualified crewmember in operations. Thus, USAF will get a more cost-effective return for its investment in training. (See the cost analysis section of this paper).

Adoption of this proposal will decrease the cost of UNTS and probably CCTS and local training through specialization. What about the professional navigator who wants a career in the Air Force? The Air Force will get more than four year's return (and a higher return for lower cost) on its investment , but will this hurt the navigator profession? The answer to this question is provided in a corollary to the proposed specialization. After a navigator has made a career commitment, he will be returned to school where he will pursue "graduate" work in navigation. The school will be designed to broaden the navigator's background in navigation systems, both through actual instruction and through interaction with navigators from other commands. This will take the career navigator beyond being a technician and develop him into a professional navigator. A graduate navigation school will allow him to move more freely between

aircraft systems as well as prepare him for future instructor duties. Further, his total qualification will enable him to provide detailed technical insight into the development of future systems and programs in the highly specialized career field he has chosen as his profession.

The model depicted below follows the navigator throughout his career after he finishes his preliminary qualification training.

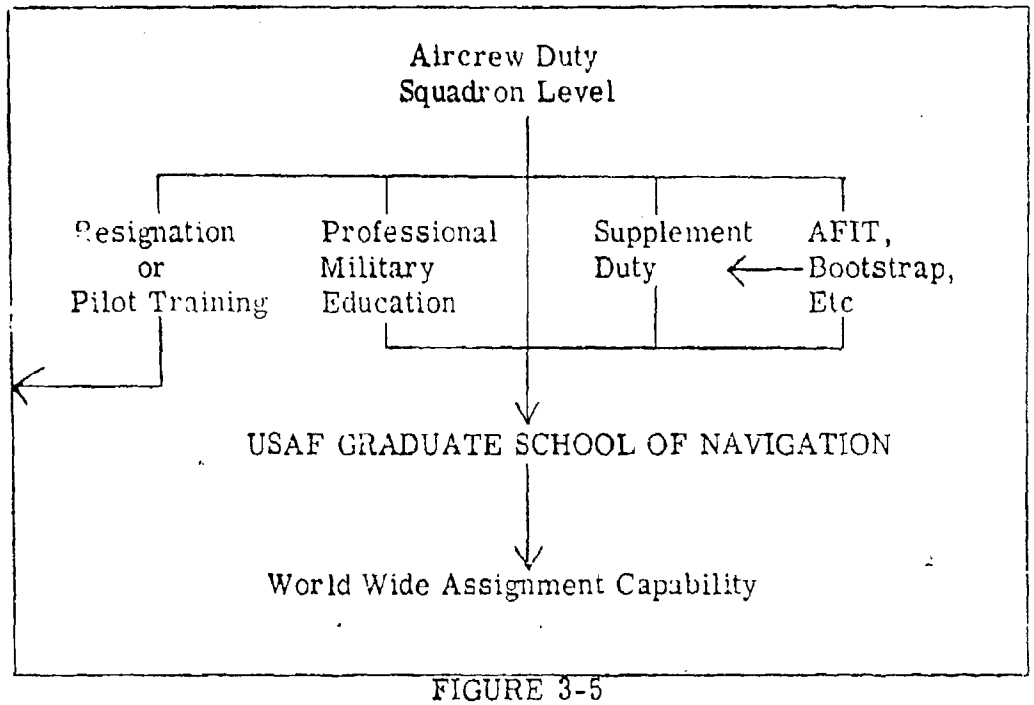


FIGURE 3-5
CAREER FLOW

Naturally, the concept of the model just shown would represent additional training costs and involve some unproductive time. Remember, that the savings obtained by specialization would offset a great portion of this expense (both time and money). Note also that the training would also take place at a point in time when the navigator is "on the move" anyway.

The important points are:

1. Only those navigators who are career committed would be educated (as opposed to trained) in the total environment of navigation.

2. Educational concepts such as recency, frequency, feedback and reinforcement would offer theoretical training at a time when post operational experience would make it most beneficial.

Precedence for advanced education has long been recognized by the Royal Air Force in their Specialist Navigation School and by the Canadian Forces' Aerospace Systems Course. Both these schools combine professional military education and theoretical advanced concepts for those officers who have established themselves as leaders and professional navigators. Our present system of graduated professional military education(PME) encompasses the leadership role, but nowhere can a career navigator broaden his technical knowledge. Mather AFB presently does offer a short course to a select few senior navigators, but this course is too limited in scope for anyone to call it graduate education for the hard core of our professionals.

PROPOSED COURSE SYLLABUS

Table 3-6 proposes a course outline to accomodate the operational training flow proposed in Figure 3-4. Once again, this outline is proposed as a sample. Details of specific hours and exact subject matter is not its objective. It is presented as a feasibility model to amplify the concept and establish the rationale for the cost analysis of Chapter Four.

The principle objective of the course outline is to structure a combination of the existing UNTS, NBT and EWOT courses into the flow pattern described in Figure 3-4. The reader may wish to refer to the course descriptions outlines in the beginning of this chapter to highlight the degree of specialization that this model depicts. In principle, only those courses were removed from specific curricula that did not add to the exact nature of the training objective. Both the NBT course and the EWO course were left in tact with regard to total hours.

TABLE 3-6
PROPOSED COURSE OUTLINE

Basic Course - 76 Days

ACADEMICS	HOURS
Physiology and Life Support	38
Basic Systems	31
Basic Procedures	67
Basic Aids	53
Avionics	56
Aircraft Systems	10
Weather	16
	271

SIMULATOR	ACTUAL	SUPPORT	
Avionics	20	19	39
FLYING			
T-43	45	46	91
MILITARY			
Total			89

STRATEGIC

ACADEMICS		
Low Level		17
Night Celestial		25
Grid		17
Bombing		229
		288

SIMULATOR	A	S
Low Level	8	10
Night Celestial	8	10
Grid	8	10
Bombing	95	25
		174

FLYING		
Low Level	15	12
Day Celestial	10	8
Night Celestial	20	16
Grid	10	8
Advanced Low Level	10	8
		126

TACTICAL

ACADEMICS		
Low Level		17
Tac Nav		29
		46

SIMULATOR	A	S
Low Level	8	10
Tac Nav	12	14
		44

FLYING		
Low Level	15	12
Adv. Low Level	10	8
Command	10	8
Combined Aids	10	8
		81

TRANSPORT

ACADEMICS		
Tactical Navigation		29
Night Celestial		25
Grid		17
Global Navigation		26
		97

SIMULATOR	A	S
Tactical Nav	12	14
Night Celestial	8	10
Global	24	24
Grid	8	10
		110

FLYING		
Day Celestial	10	8
Night Celestial	20	16
Global Nav	15	12
Airways	10	8
Grid	10	8
Combined Aids	5	4
		126

SPECIAL

ACADEMICS	
Basic Electronics	54
Reconnaissance	100
Bomber Defense	202
Special Application	65
	421

SIMULATOR	A	S
AN/ALQ-T5	66	66
AN/ALQ-T4	24	16
		172

FLYING
NONE

A close review of Table 3-4 reveals a rather uniform flow of training with the exception of the Tactical Specialist. There is a significant omission in the present course of training oriented toward the Weapons System Officer (WSO, AFSC 1555). In keeping with the total ATC training involvement in this area the same omission is presented. As pointed out by Doyle ATC has the capability in this area, however, ATC's contract with Tactical Air Command (TAC) does not include such training. As an ancillary recommendation, the author would suggest strengthening in this area. In general that would include the following training:

TACTICAL	HOURS	
Academics		
Air to Air Operations	30	
Tactical Bombardment	70	
	100	
Simulator	A.	S.
Air to Air	15	15
Tactical Bombardment	20	20
	35	35
	70	
Flying		
T-37	10	25
T-43	10	12
	20	37
	57	

TABLE 3-7
TACTICAL SUPPLEMENTARY TRAINING

Since this material is presently not under contact it was not included in this proposal. A cost analysis shows its addition to both the present scheme and the proposal of this paper would simply add this cost to either. It appears that its' addition or deletion is a matter of politics more than training effectiveness.

A comparison of hours and/or days to evaluate the savings offered by the proposed alternative is detailed in chapter four, cost analysis. One can easily see that if some courses are deleted and none added that a savings in time is made. Table 3-8 summarizes the savings in student hours. A word of caution, this summary DOES NOT include the ratio of students to instructors, so should in no way be viewed as the same data presented in chapter four. This data simply summarizes the savings in student hours to indicate the order of magnitude.

PRESENT SYSTEM				PROPOSED SYSTEM			
Course	Hours	Number Students	Student Hours	Course	Hours	Number Students	Student Hours
UNT	912	1400	1,276,800	Basic	480	1400	672,000
NBT	398	280	111,440	Strategic	588	280	164,640
EWOT	666	200	133,200	Tactical	171	280	47,880
			1,521,440	Transport	333	640	213,120
				Special	600	200	120,000
							1,217,640

TABLE 3-8
SUMMARY OF STUDENT HOURS SAVED

GRADUATE NAVIGATION

The difference in student hours of 303,800 represents a savings (from Table 3-8). This savings may be viewed as a benefit of efficiency or a liability in training lost. The focus of this paper is on providing efficient, high quality training at a time when it benefits the navigator and the Air Force to the greatest extent. The most effective way to satisfy both conditions of efficiency and quality is to defer the savings until it optimizes the return. It was stated earlier in this paper that many navigators leave the service after their initial service commitment. With this in mind, it seems rational to defer the highest quality of training until it is only given to career oriented, professionals.

A high quality graduate education program can utilize some of the hours (and dollars) saved through specialization and more than correct any perceived liability in training lost. No attempt will be made to deliniate how the savings in time should be utilized beyond a few general comments. ATC has means at their disposal for a detailed analysis through ISD. Some thoughts, however, are in order. A course length of approximately 50 academic days (2½ calendar months) with an annual student enrollment of 600 navigators would be a reasonable proposal.

If each class had 15 students, a class would enter and graduate every sixth academic day. This would require a faculty of 21 instructors offering 275 hours of academic education and 25 hours available for each student on a one to one basis. The author would suggest that a detailed study be made of the Canadian and British courses in concert with the existing Senior Navigator's Course at Mather AFB. These programs view such education as an investment in their career officers rather than an expense appurtenant to a technical career.

Simply a rehash of undergraduate material would be a waste of time. An innovative and productive feature of such a graduate course would be the interpersonal feed back. Students fresh from varying professional backgrounds brought together for several months might naturally share their perceptions, viewpoints, and experiences. Under the direction of professional instructors, these discussions would take the form of symposiums. Perhaps midway through the course the graduate students could prepare detailed technical presentations of their particular specialty as a means of developing theory understanding in the group. The effect would be synergistic! Not only would the broad scope of navigation be covered but also individual communicative skills would be sharpened by the presentations. A final phase of the course could be independent study in preparation for the graduate's next assignment in the form of a professional paper. As a side benefit, the best of these papers would be available for publication in The Navigator Magazine. In a period of shrinking budgets through inflation and military cutbacks it may well be time to follow General Ryan's advice "It's time to work smarter...not harder."

APPENDIX F

COMPARISON OF CURRENT AND SPECIALIZED NAVIGATOR TRAINING PROGRAMS

Directorate of Navigator Training,
Headquarters Air Training Command,
22 March 1976

COMPARISON OF CURRENT AND SPECIALIZED NAVIGATOR TRAINING PROGRAMS

Directorate of Navigator Training
Hq Air Training Command
22 Mar 76

Atch 1

CONTENTS

APPENDICES

Section I

Executive Summary

As an action item at the 1974 Navigator Training Conference, a study was begun to identify possible navigator training course modifications. Pursuit of this initiative resulted in reviewing the current Undergraduate Navigator Training (UNT) program and comparing it to a proposed program which includes a Basic Navigator Training (BNT) course with follow-on specialized (track) courses for Electronic Warfare, Navigator-Bombardier, Airlift, and Weapon System Officer (WSO) training. All proposed programs may necessitate modifying the T-43 aircraft and/or the T-45 simulator to improve air intercept, bombing, and electronic warfare training.

This specialized training program is a major departure from the current training which produces a proven and effective product: the "universally assignable" navigator. However, its implementation would align all navigator training programs with the current USAF Rated Distribution and Training Management plan which assigns navigators to "worlds" with limited crossover throughout their career. Utilizing this management concept eliminates the need to teach all basic navigation procedures/aids and consequently should reduce T-43 flying time. Adoption of a multi-track program may generate significant improvements in the quality of the navigator training graduate.

Implementation of a specialized navigator training program will generate immediate and long range impacts on the navigator career field. This will vary from tradeoffs between ATC specialized navigator training courses and major command RTU/CCTS programs to future resource flexibility of navigators in weapon system inventories and interservice training implications. A full assessment of these considerations must accompany any implementation of this proposal.

SECTION II

Background

At the 1974 USAF Navigator Training Conference, ATC/DON was tasked to examine Undergraduate Navigator Training (UNT), Navigator-Bombardier Training (NBT), and Electronic Warfare Officer Training (EWOT) resources and Mather AFB training capabilities in relation to the Navigator-Observer Utilization Field Flying Specialties Study (NOUFFSS) and major command navigator task requirements. Subsequently, ATC/DON training program recommendations would be submitted to Hq USAF/DPPTF.

ATC/DON has developed a Navigator Training Study Charter outlining the parameters for designing alternative methods of training navigators. A specialized training program has been generated which may reduce training costs while improving graduate quality within each navigator specialty. The proposal includes a common basic core course leading into four area specialization courses.

The entire program was briefed at the November 1975 UNT Course Training Standard Conference. MAJCOM representatives approved ATC's conceptual effort and were informed of ATC's intention to forward the proposal for Hq USAF review.

SECTION III

Current Navigator Training Program

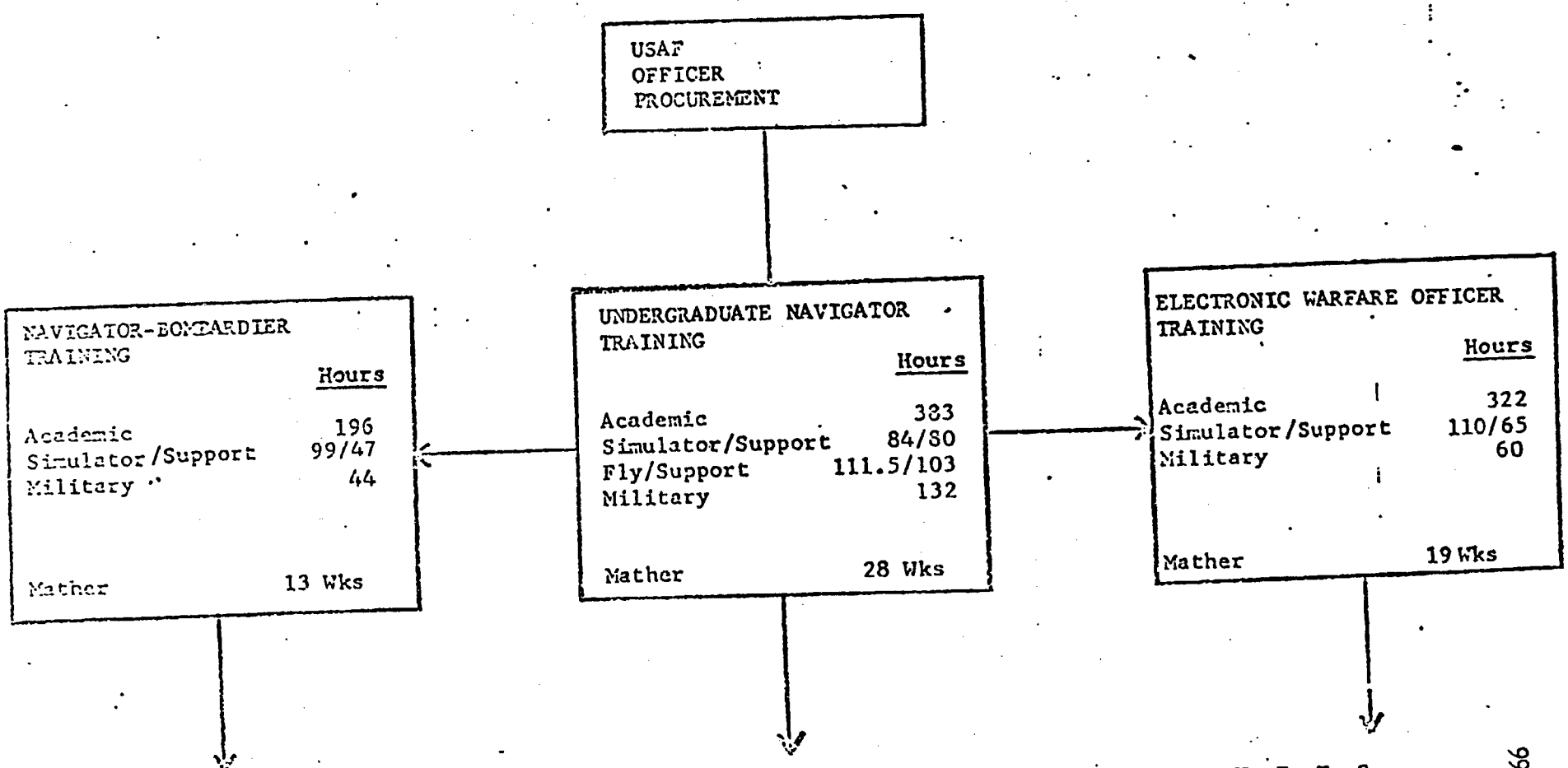
A. Current Program

The current 28 week UNT program uses a generalized training approach in which all students train in the same navigator skills to the same performance standards (Appendix A). The program encompasses all aspects of navigation and prepares each graduate to enter either one of two advanced training courses (NBT or EWOT) or proceed directly into combat crew training and then to his respective aircraft assignment (Appendix B and C). Ultimate assignments encompass all navigator-manned aircraft in the USAF inventory.

B. Weaknesses

A generalized navigator training program is not the most effective use of training resources. Increased specialization in weapon systems requires a navigator specifically trained for his follow-on mission aircraft and operational environment. A generalized approach continually over-trains the student navigator by exposure to a general navigation curriculum yet under-trains by denying in-depth specialized area instruction.

CURRENT NAVIGATOR TRAINING PROGRAMS



Section IV

Specialized Training Programs

A specialized training program is oriented to a "mission" or multi-track concept. The concept embodies a common core basic course with phased exit points to each of four specialized tracks. The entire training concept is designed to improve navigator quality by teaching only the vital subjects required by the student's assigned weapon system. Organizing navigator training into this concept results in flying hour savings since only essential training phases are reinforced by flight missions.

a. Basic Navigator Training

The Basic Navigator Training core course (BNT) is patterned after the current UNT program except for the various phase points which enable students to exit BNT after completing the curriculum related to their future speciality (Appendix D). The first phase point is at 14 weeks when EWO and WSO identified students would exit BNT for their specialized training. They would not receive any celestial, grid, or global training. At the 20 week phase point, NBT identified students would exit BNT and not receive any global training. Airlift and tanker identified students would receive the entire BNT curriculum. Subsequently, airlift students would attend a specialized course. Tanker identified students would receive an aeronautical rating upon completing BNT and an assignment to tanker CCTS. EWO, WSO, NBT, and Airlift students would receive their aeronautical rating upon completing their specialized training.

b. Weapon System Officer Training

At the 1974 Navigator Training Conference, TAC proposed revisions to the UNT course which would provide TAC with better qualified graduates for F-4, RF-4 and F-111 combat crew training (Appendix E).

The WSO academic, simulator, and flying phases are new additions to the current navigator training curriculum and are designed to meet TAC's requirements within a 14 week program. The WSO program would provide specialized instruction in Low Level, Instruments, Aerodynamics/ Maneuvering, Air-to-Ground, Air-to-Air, Electronic Warfare, and Tactical Operations (Appendix F).

c. Electronic Warfare Officer Training

The 21 week EW track incorporates the current 19 week EWOT course and adds four T-43 flight missions to compensate for the 80 hour reduction (proposed EWT vs current UNT) in flying time prior to EW training (Appendix G). The flight missions would enable students to maintain proficiency in basic airmanship skills while attending their specialized training program.

d. Navigator-Bombardier Training

The 24 week NBT course includes all currently taught subjects and the following academic areas: SAC Celestial, Grid, and Low Level procedures (Appendix H). Reinforcement of the Low Level academics occurs through T-45 low level simulator and T-43 flight missions.

e. Airlift Training

Airlift academic, simulator, and flying phases are new additions to the current navigator training curriculum and are designed to meet Military Airlift Command requirements within a 8 week program (Appendix I). The airlift program would provide specialized instruction on Global, Grid, and Aerial Delivery procedures.

BASIC NAVIGATOR TRAINING

Subject	Acad	Sim		Fly		Supt
Military Tng	84					
Aviation Phy	28					
Life Support	14					
Airmanship	35	T-40	4	T-37	6.5	21
Weather	12					
Adv Airmanship	33					
Nav Procedures	77					
Nav Systems	39	T-45	20	T-43	25	39
Acft Systems	7					
Elec Warfare	9					
Day Cel	29	T-45	4	T-43	20	19
Nite Cel	26	T-45	4	T-43	20	23
Grid	17	T-45	8	T-43	10	17.
Military Tng	18					
Global Tng	30	T-45	20	T-43	20	37
Military Tng	8					
Totals	466		60		101.5	156

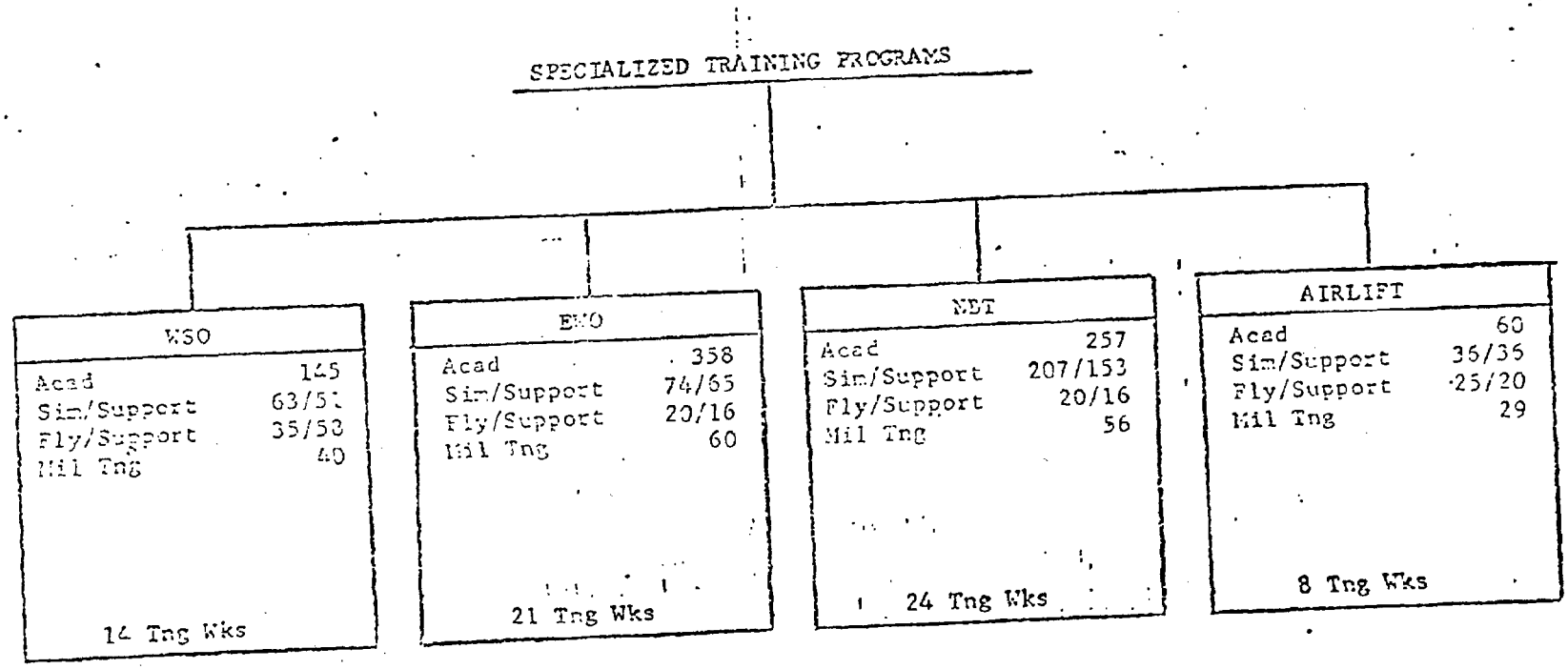
783.5 Hrs

14 Tng Wks — Fly/Support 31.5/39, Sim/Support 24/18, Acad 254, Mil Tng 84

20 Tng Wks — Fly/Support 50/38, Sim/Support 20/21, Acad 72, Mil Tng 18

23 Tng Wks

- WSO
- EWT
- NBT
- Tanker
- Airlift

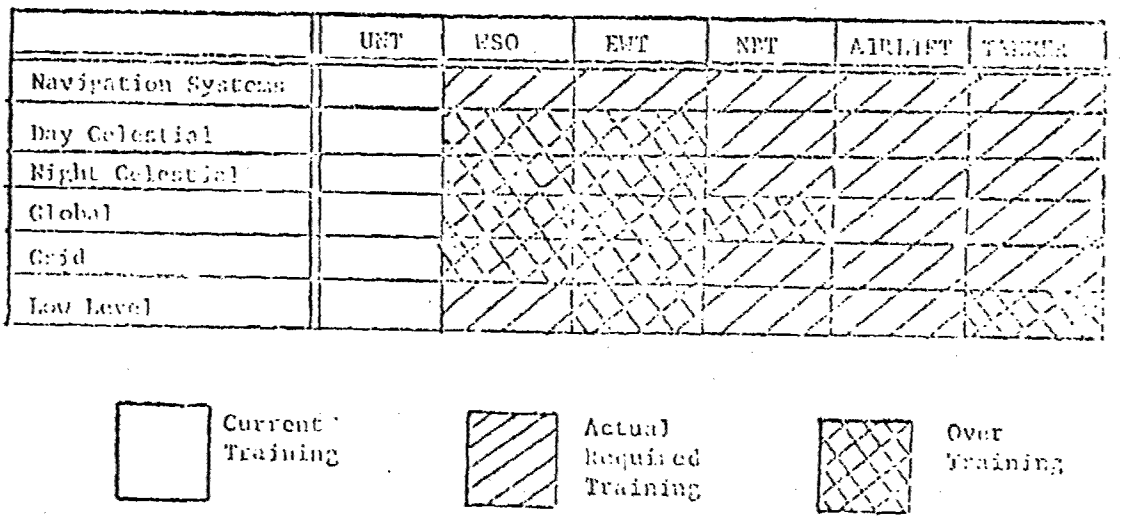

SPECIALIZED TRAINING PROGRAMS
WSO
Acad 145
Sim/Support 63/51
Fly/Support 35/50
Mil Tng 40
14 Tng Wks
EWO
Acad 358
Sim/Support 74/65
Fly/Support 20/16
Mil Tng 60
21 Tng Wks
NFT
Acad 257
Sim/Support 207/153
Fly/Support 20/16
Mil Tng 56
24 Tng Wks
AIRLIFT
Acad 60
Sim/Support 36/36
Fly/Support 25/20
Mil Tng 29
8 Tng Wks

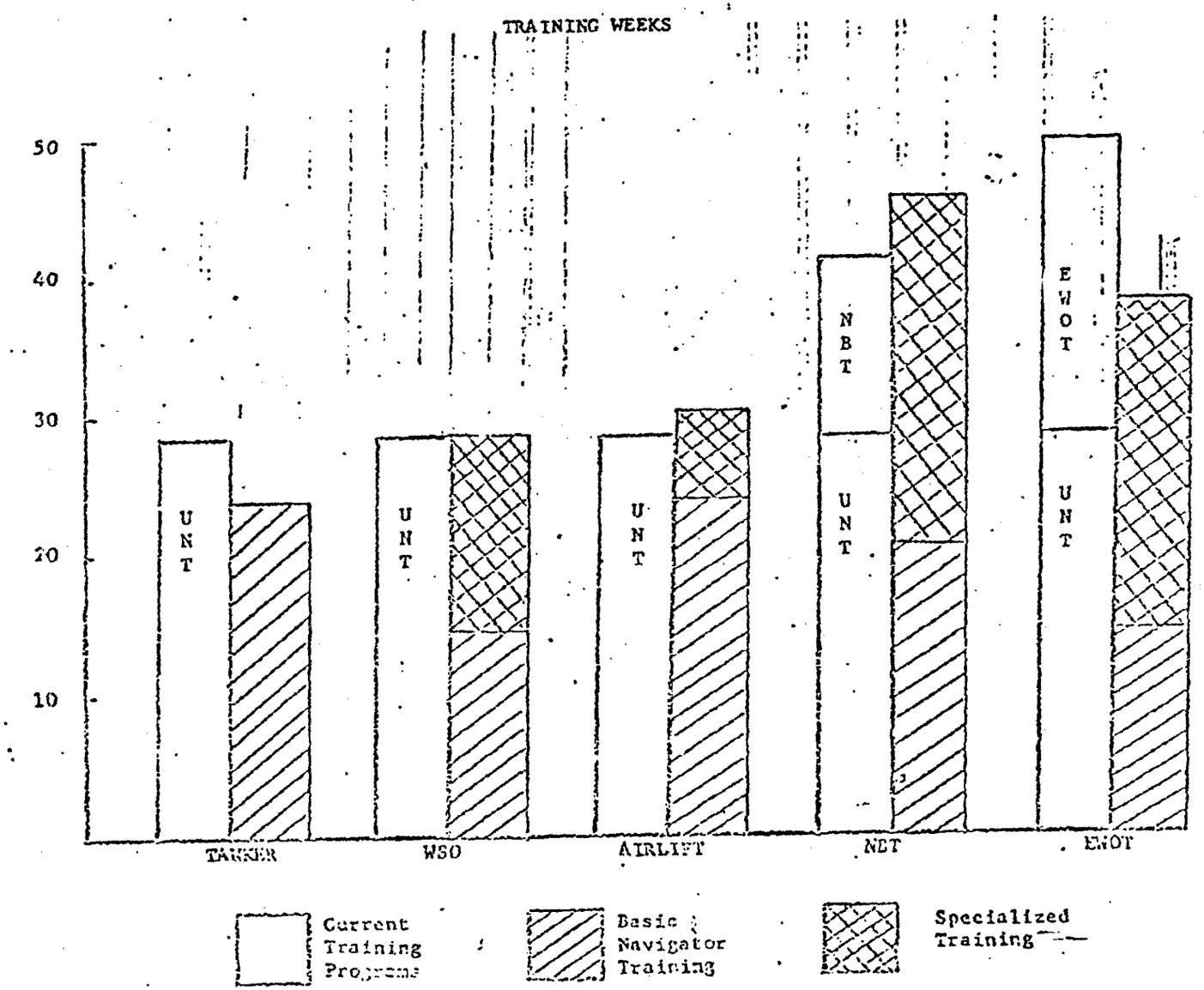
SECTION V

Comparison of Current Navigator Training Programs Versus Specialized Training Programs

While the current program produces an effective product, the proposed specialized programs offer a higher quality graduate within each navigator specialty.

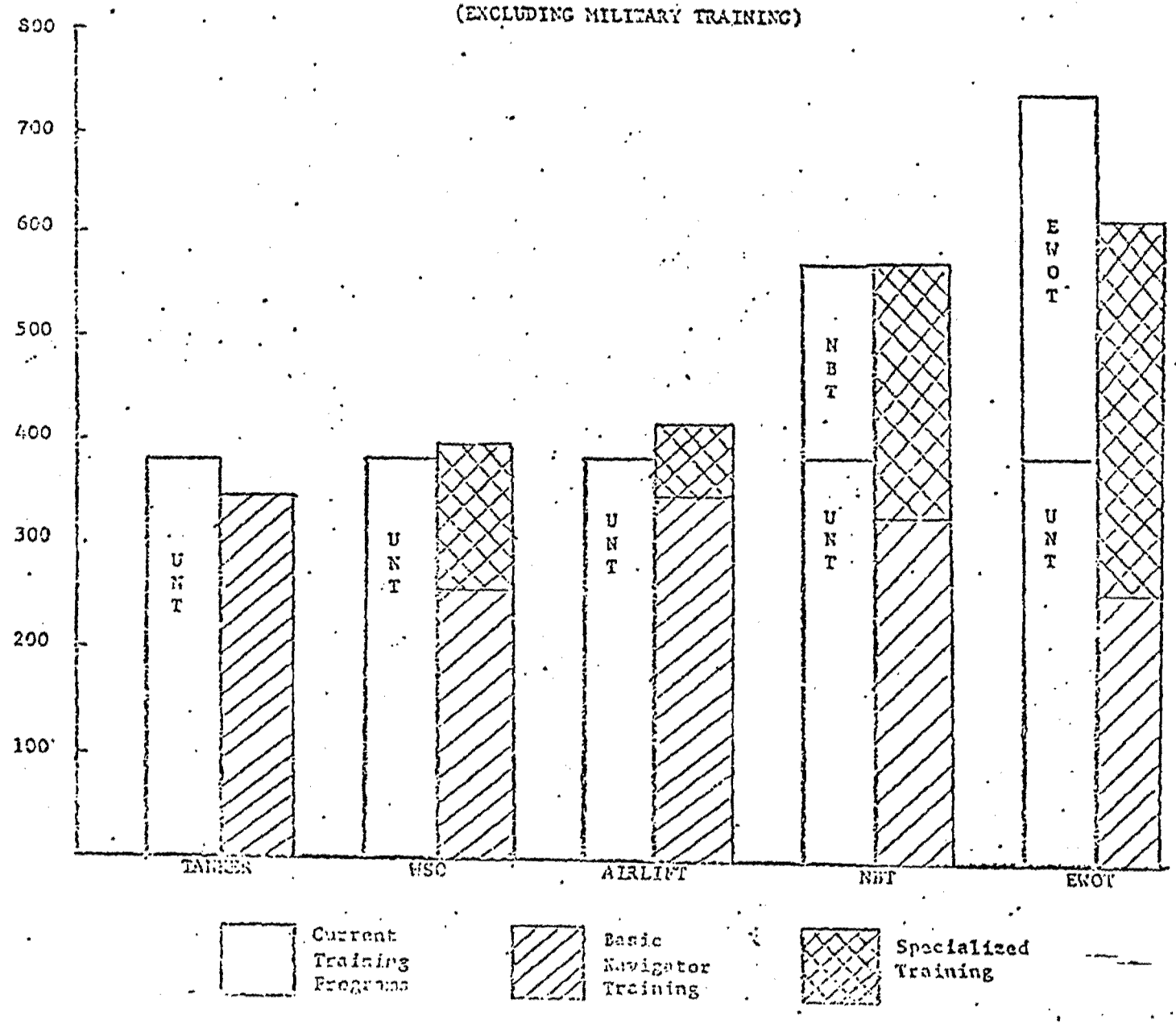
The following chart summarizes the major curriculum phases of UNT and highlights the current over-training for students programmed to WSO, EWT, NBT, or tanker weapon system areas. The economy of training time/resources achieved by eliminating over-training is further illustrated in subsequent charts.

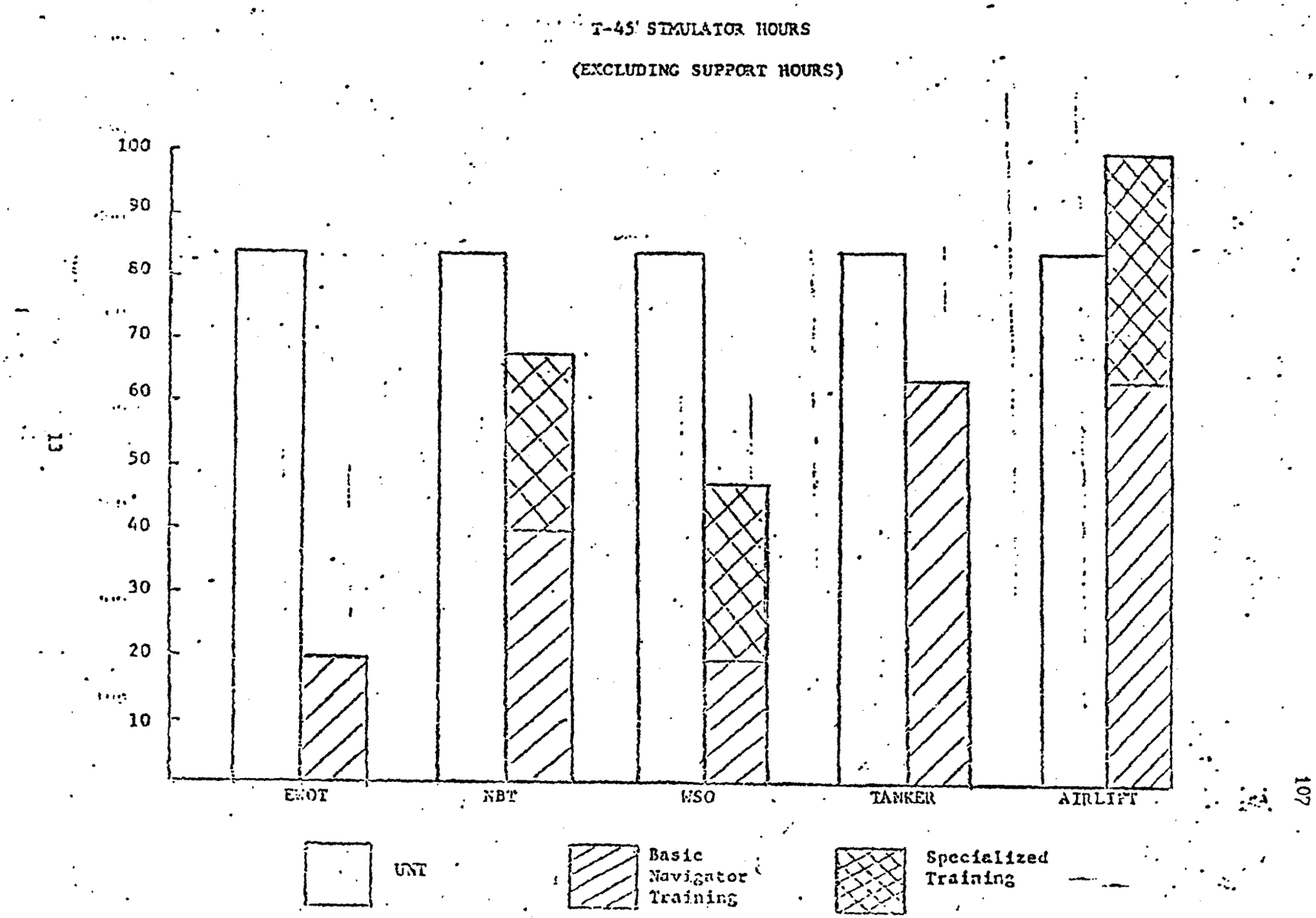



TRAINING WEEKS
50
40
30
20
10
UNT
UNT
UNT
NBT
UNT
EWOT
UNT
TANKER
WSO
AIRLIFT
NBT
EWOT
Current Training Programs
Basic Navigator Training
Specialized Training

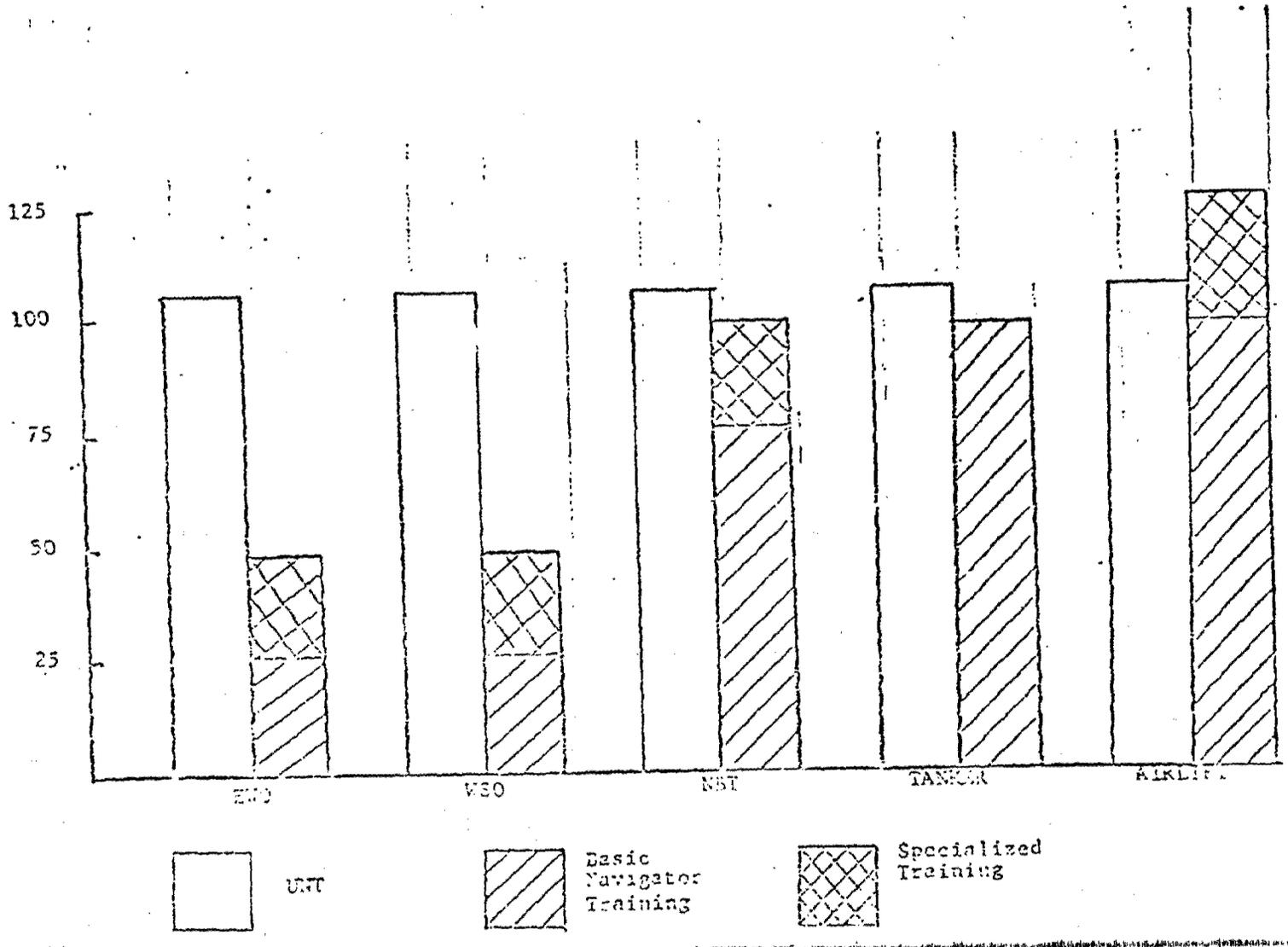
ACADEMIC HOURS

(EXCLUDING MILITARY TRAINING)




T-45 SIMULATOR HOURS
(EXCLUDING SUPPORT HOURS)
100
90
80
70
60
50
40
30
20
10
EWOT
NBT
WSO
TANKER
AIRLIFT
UNT
Basic Navigator Training
Specialized Training

T-43 FLYING HOURS



those navigation procedures/aids which are required in each world. Any additional basic navigator training results in over-training and, therefore, is not cost effective.

d. Modifications to Current Navigator Training Programs

The WSO and NFT track programs may require changes to current T-45 simulator hardware or additional simulator equipment. WSO academics may require T-45 modifications in the air-to-air, air-to-ground, and electronic warfare areas. Use of F-4 simulators or a Mather fabricated intercept trainer are alternatives to modifying the T-45 for air intercept training. The NFT track program may also require supplementing weapons delivery academic training in the T-45 simulator.

APPENDIX A

Undergraduate Navigator Training

1. Academic Training

	Hours
a. Aviation Physiology	28
b. Life Support	14
c. Airmanship	35
d. Weather	12
e. Advanced Airmanship	32
f. Navigation Procedures	77
g. Navigation Systems	39
h. Aircraft Systems	7
i. Day Celestial	29
j. Night Celestial	26
k. Global	30
l. Grid	17
m. Low Level	16
n. Operational Procedures	10
o. Electronic Warfare	9
p. EP Exam/Critique	3
	384

2. Trainer/Simulator Training

	Msns	Hours	Support Hours	Total Hours
a. T-40	2	4		4
b. T-45	Msns	Hours	Support Hours	Total Hours
(1) Navigation Systems	5	20	18	38
(2) Day Celestial	1	4	4	8
(3) Night Celestial	2	8	8	16
(4) Global	5	20	21	41
(5) Grid	2	8	9	17
(6) Low Level	5	20	20	40
(7) Departures & Arrivals	1	4	--	4
Totals	21	84	80	164

3. Flying Training

	Msns	Hours	Support Hours	Total Hours
a. T-37	5	6.5	22	28.5
b. T-43				
(1) Navigation Systems	5	25	18	43
(2) Day Celestial	4	20	15	35
(3) Night Celestial	4	20	15	35
(4) Global	4	20	16	36
(5) Grid	2	10	8	18
(6) Low Level	2	10	8	18
Totals	26	111.5	102	213.5

		113
4. Military Training		Hours
a. Processing and Indoctrination		37
b. Career Planning		14
c. Physical Training		81
	Total	132

APPENDIX B

Navigator-Bombardier Training (AN/ASQ-38 Course)

1. Academic Training	Labs	Academic	Total
a. Weapons Delivery Training	1	32	33
b. Offensive Systems	2	30	32
c. Operations	0	48	48
d. Computers	6	26	32
e. Radar	2	23	25
f. SRAM	0	26	26
Totals	11	185	196

2. Simulator Training	Hours
a. Operating Procedures	82
b. Mission Planning	23
c. SRAM Operating Procedures	23
d. SRAM Mission Planning	7
e. SRAM/TGB Makeup	11
Total	146

3. Military Training	Hours
a. Processing and Orientation	18
b. Physical Training	26
Total	44

Navigator-Bombardier Training (AN/ASQ-48 Course)

1. Academic Training	Simulator	Academic	Total
a. Weapons Delivery	1	32	33
b. Offensive Systems	2	30	32
c. Computers	3	26	29
d. Operations	0	38	38
e. Radar	2	24	26
Totals	8	150	158

2. Simulator Training	Hours
a. Operating Procedures	70
b. Mission Planning	27
c. Check Mission Makeup	6
Total	103

3. Military Training	Hours
a. Processing and Orientation	15
b. Physical Training	22
Total	37

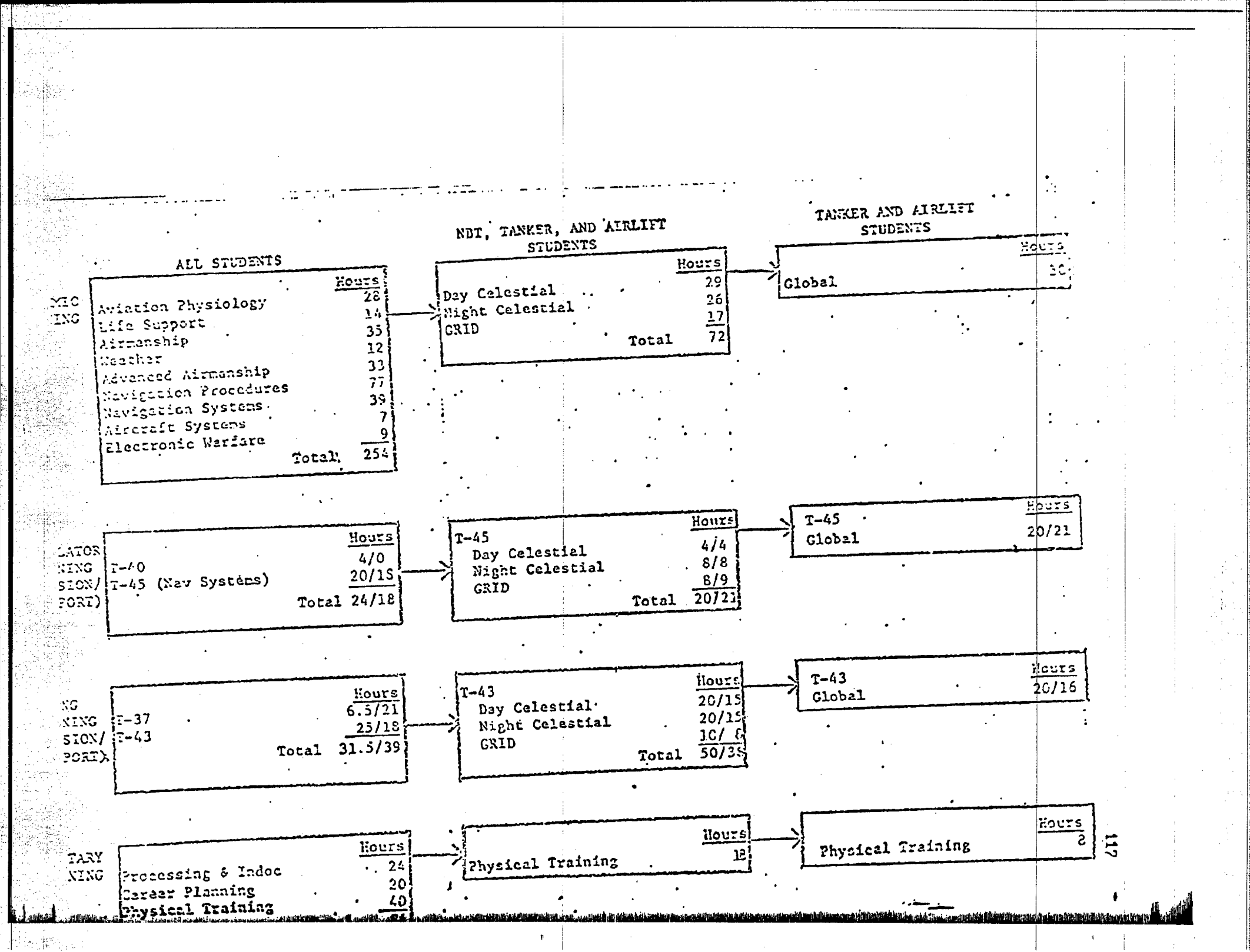
APPENDIX C

Electronic Warfare Officer Training

1. Academic Training	Simulator	Classroom	Total
a. Basic Electronics	0	42	42
b. Transmission and Reception	0	39	39
c. Radar Syster	2	40	42
d. Signal Recognition	0	18	18
e. EW Support Measures	13	72	85
f. EW Penetration Systems	12	30	42
g. Strike Support Systems	6	19	25
h. EW Attack Systems	3	17	20
i. Special EW Applications	0	45	45
Totals	36	322	358

2. Simulator Training	Msns	Hours	Support Hours	Total Hours
a. EW Support Measures	11	33	34	67
b. Electronic Countermeasures	7	21	11	32
c. Strike Support	4	12	11	23
d. EW Attack	4	8	9	17
Totals	26	74	65	139

3. Military Training	Hours
a. Processing and Orientation	17
b. Physical Training	43
Total	60


ALL STUDENTS
Hours
Aviation Physiology 28
Life Support 14
Airmanship 35
Weather 12
Advanced Airmanship 33
Navigation Procedures 77
Navigation Systems 39
Aircraft Systems 7
Electronic Warfare 9
Total 254
NDI, TANKER, AND AIRLIFT STUDENTS
Hours
Day Celestial 29
Night Celestial 26
GRID 17
Total 72
TANKER AND AIRLIFT STUDENTS
Hours
Global 30
Hours
T-40 4/0
T-45 (Nav Systems) 20/18
Total 24/18
T-45
Hours
Day Celestial 4/4
Night Celestial 8/8
GRID 8/9
Total 20/21
T-45
Global
Hours
20/21
Hours
T-37 6.5/21
T-43 25/18
Total 31.5/39
T-43
Hours
Day Celestial 20/15
Night Celestial 20/15
GRID 10/ 8
Total 50/38
T-43
Global
Hours
20/16
Hours
Processing & Indoc 24
Career Planning 20
Physical Training 40
Physical Training
Hours
12
Physical Training
Hours
2

APPENDIX E

- Assessment of TAC assigned UNT graduates
  - Overtrained since UNT course includes:
    - Celestial
    - Pressure Pattern
    - Loran
  - Undertrained since UNT course does not include:
    - Radar bombing
    - Intercepts
    - EW/Penetration aids
- TAC proposed long range solutions to alleviate training shortfalls
  - Revise UNT program to include:
    - Air-to-air intercepts
    - EW/Penetrations aids
    - High speed low level nav/bomb
    - Basic airmanship
      - Theory of flight
      - Controls and instruments
      - IFR/VFR landing approach reference systems
      - Air traffic control
      - Basic flight maneuvers
      - Recovery from unusual attitudes
      - Instrument interpretation
  - Expand TAC fighter pilot/WSO lead-in course
- Conclusion: Vigorous action must be taken to revise or expand navigator training courses to meet TAC fighter training requirements.

Source: 1974 Navigator Training Conference, TAC/DOOT Briefing

APPENDIX F

WSO TRAINING

	Hours
1. Academic Training	
a. Low Level	21
(1) Flight Planning	
(2) Radar/Visual	
(3) Route Analysis	
(4) Time and Course Control	
(5) Route Study	
b. Instruments	15
(1) Flight Planning	
(2) Performance Charts	
(3) Instrument Procedures	
(4) USAF Instrument Exam	
c. Aerodynamics/Maneuvering	8
(1) Stalls	
(2) Maximum Performance Maneuvers	
(3) Basic Fighter Maneuvers	
(4) Formation	
d. Avionics	10
(1) Radar	
(2) INS/Navigation Computer	
(3) WRCS	
e. Air-To-Ground Weapons/Delivery	25
(1) Conventional	
(2) Nuclear	
(3) Delivery Computations/Visual/Radar	

	120	
f. Air-To-Air Weapons/Delivery		31
(1) Weapons/AIM-7/AIM-9		
(2) Commentary		
(3) Intercept Geometry		
(4) Basic Attacks		
g. Electronic Warfare		23
(1) Hostile Air Defense		
(2) Radar Warning Receivers		
(3) Electronic Countermeasures		
(4) EW Tactics		
h. Tactical Operations		12
(1) Night Operations		
(2) Refueling		
(3) Intelligence		
(4) New Developments		
	TOTAL	145

2. Trainer/Simulator Training

	Missions	Hours	Support Hours	Total Hours
a. T-40				
(1) Instruments	2	4		4
(2) Aerodynamics/Maneuvering	2	4		4
b. T-45				
Low Level	7	28	28	56
c. T-5				
EW Operations	3	7	3	10
d. Air-To-Air Procedures	10	20	20	40
TOTALS	24	63	51	114

3. Flying Training

	Missions	Hours	Support Hours	Total Hours
a. T-37				
(1) Low Level	3	4.5	12.6	17.1
(2) Instruments	2	3.0	8.4	11.4
(3) Aerodynamics/Maneuvering	5	7.5	21.0	28.5
TOTALS	10	15.0	42.0	57.0
b. T-43				
Low Level	4	20	16	36

4. Military Training

	Hours
a. Processing and Indoctrination	10
b. Physical Training	30
TOTAL	40

APPENDIX G

Electronic Warfare Officer Training (Proposed)

1. Academic Training	Simulator	Classroom	Total
a. Basic Electronics	0	42	42
b. Transmission and Reception	0	39	39
c. Radar System	2	40	42
d. Signal Recognition	0	18	18
e. EW Support Measures	13	72	85
f. EW Penetration Systems	12	30	42
g. Strike Support Systems	6	19	25
h. EW Attack Systems	3	17	20
i. Special EW Applications	0	45	45
Totals	36	322	358

2. Simulator Training	Msns	Hours	Support Hours	Total Hours
a. EW Support Measures	11	33	34	67
b. Electronic Countermeasures	7	21	11	32
c. Strike Support	4	12	11	23
d. EW Attack	4	8	9	17
Totals	26	74	65	139

3. T-43 Flying Training	Msns	Hours	Support Hours	Total Hours
High Level Radar	4	20	16	36

4. Military Training	Hours
a. Processing and Orientation	17
b. Physical Training	43
Total	60

APPENDIX H

Navigator-Bombardier Training (Proposed)

1. Academic Training	Labs	Academic	Total
a. Low Level	0	25	25
b. Weapons Delivery	1	32	33
c. Offensive Systems	2	30	32
d. Operations	0	48	48
e. Computers	6	26	32
f. Radar	2	23	25
g. SRAM	0	26	26
h. Celestial/Grid	2	12	36
Totals	13	222	257

2. Simulator Training	Hours	Support Hours	Total Hours
a. T-45			
Low Level/Celestial	28	28	56
b. T-10			
(1) Navigation Procedures	27	23	50
(2) High Altitude Bombing	41	27	68
(3) Low Altitude Bombing	51	31	82
(4) SRAM Operating Procedures	24	17	41
(5) Integrated Profile	36	27	63
Totals	207	153	360

3. T-43 Flying Training	Msns	Hours	Support Hours	Total Hours
Low Level	4	20	16	36

4. Military Training	Hours
a. Processing and Indoctrination	18
b. Physical Training	38
Total	56

APPENDIX I

Airlift Training

		Hours
1.	Academic Training	
	a. Global	25
	(1) FLIP	
	(2) Charts	
	(3) Computer Flight Plans	
	(4) Fuel Planning	
	(5) Search and Rescue	
	b. Grid	15
	(1) Charts	
	(2) Steering	
	(3) Mission Planning	
	c. Aerial Delivery	25
	(1) Chart Preparation	
	(2) Flight Planning	
	(3) Radar	
	(4) Route Analysis	
	(5) Time and Course Control	
	(6) CARP	
	Total	60

		Msns	Hours	Support Hours	Total Hours
2.	T-45 Simulator Training				
	a. Global/Grid	4	16	16	32
	b. Aerial Delivery	5	20	20	40
	Total	9	36	36	72

3. T-43 Flying Training	Missions	Hours	Support Hours	Total Hours
a. Global/GRID	1	5	4	9
b. Aerial Delivery	4	20	16	36
TOTALS	5	25	20	45

4. Military Training	Hours
a. Processing and Indoctrination	5
b. Physical Training	24
TOTAL	29

APPENDIX J

Student Entry, Load, and Production Data

For Specialized Training Programs

The following charts indicate student entries, load, and production data for each segment of the basic navigator training course and the specialized training courses.

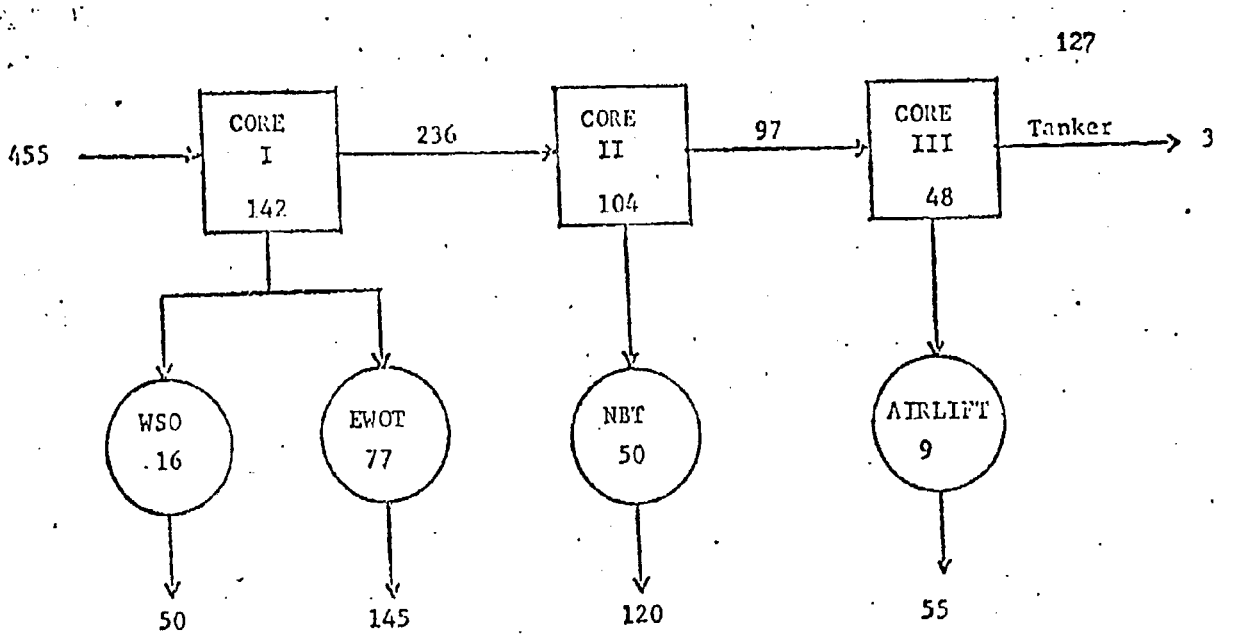
a. Core I is BNT curriculum for all students.

b. Core II is BNT curriculum for NBT, airlift, and tanker students.

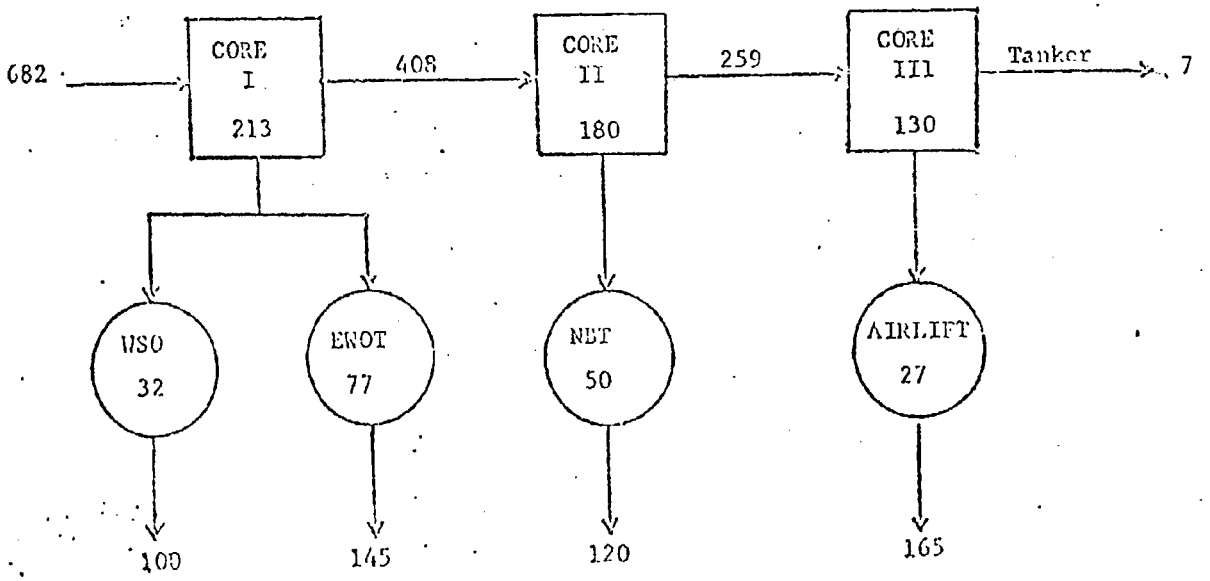
c. Core III is BNT curriculum for airlift and tanker students.

d. All data is based on 12% attrition rate.

e. Average student load data is listed immediately under core and specialized training titles.



600 ANNUAL PRODUCTION



APPENDIX G

1977 UNT WEAPONS SYSTEMS OFFICER

PRELIMINARY COURSE OUTLINE

Approved in May Conference

UNT

Weapon Systems Officer

Preliminary Course Outline

WSO Preliminary Course Outline

Course Statistics

		Hours
Academics (Includes 4 Examinations)		
Aircraft General (Includes Exam)		22
Flight Performance (Includes 2 Exams)		28
Low Level		37
T-37 Flight Mission Prebriefs		12
T45 Mission Preparation		21
Electronic Warfare (Includes Exam)		34
Processing and Indoctrination		15
	TOTAL	169
T-37 Flying (Includes 3 Evaluations)		
FM01-04	Instruments (Includes Evaluation)	5.2
FM05-07	Contact	3.9
FM08-10	Formation	3.9
FM11	Contact/Formation Evaluation	1.3
FM12-16	Low Level	6.5
FM17	Comprehensive Flight Evaluation	2.6
	TOTAL	23.4

2

Course Statistics (Cont)

			Hours
Simulators (Includes 2 Evaluations)			
SM01	(T4)	Checklist and Emergency Procedures	2.0
SM02	(T4)	Instrument Procedures	2.0
SM03	(T4)	Unusual Attitude Recoveries	2.0
SM04	(T40)	SIDS and Approaches	2.0
SM05	(T45)	SIDS and Approaches	4.0
SM06-11	(T45)	Low Level (Includes Evaluation)	36.0
SM12-14	(T45)	Low Level Weapons Delivery	18.0
SM15	(T45)	Comprehensive Course Evaluation	6.0
		TOTAL	72.0

WSO Preliminary Course Outline

Academic Emphasis Area Overview

		Hours
AG -- Aircraft General (22 Hours)		
AG01	Aircrew Publications (DASH-1)	3
AG02	Seat Refresher/Egress Training	2
AG03	Systems and Limitations	3
AG04	Flight Controls and Instruments	3
AG05	Emergency Procedures	2
AG06	Comm/Nav Review	1
AG07	AFTO Form 781	2
AG08	FLIP	2
AG09	AFRs 60-1, 60-16	1
AG10	Examination	2
AG11	Critique	1
	TOTAL	22
FP -- Flight Performance (26 Hours)		
FP01	Performance Data (TOLD)	3
FP02	AF Form 70, DD Forms 175, 1801	3
FP03	CDI/RMI	1
FP04	Fix-to-Fix Procedures	2
FP05	SIDS/Approaches/Holding	3
FP06	Airways	1
FP07	Emergency Procedures Quiz	1
FP08	Critique	1

4

		Hours
FP09	Aero I (Stalls, Spins, Recoveries)	4
FP10	Areo II (Maneuvers, Limitations)	2
FP11	Formation Terminology and Theory	2
FP12	Crew Responsibilities (Formation)	1
FP13	Formation Aerobatics	1
FP14	Phase Examination (FP)	2
FP15	Critique	1
	TOTAL	28

LL -- Low Level (37 Hours)

LL01	Introduction and Terminology	2
LL02	Chart Preparation	4
LL03	Flight and Fuel Planning	4
LL04	Low Level Radar	2
LL05	Visual Navigation	2
LL06	Route Analysis and Aircraft Positioning	3
LL07	Time and Course Control	4
LL08	Low Level Mission Planning Profile	4
LL09	HI/LO Route Study (Map Reading)	2
LL10	Weapon Delivery/Introduction and Terminology	2
LL11	Ballistics Theory	4
LL12	Weapon Delivery Computers	4
	TOTAL	37

5

		Hours
PB -- Prebriefs (12 Hours)		
PB01	Instruments (FM 1-3)	2
PB02	Instrument Check (FM 4)	1
PB03	Contact (FM 5-7)	2
PB04	Formation (FM 8-10)	2
PB05	Phase Check (FM 11)	1
PB06	Low Level (FM 12-16)	2
PB07	Comprehensive Flight Check (FM 17)	2
	TOTAL	12
MP -- Mission Preparation (T45 Sim)(21 Hours)		
MP01	SIDs and Approaches(SM05)	1
MP02	Low Level(SM06)	2
MP03	Low Level(SM07)	2
MP04	Low Level(SM08)	2
MP05	Low Level(SM09)	2
MP06	Low Level(SM10)	2
MP07	Low Level Evaluation(SM11)	2
MP08	Low Level Weapon Delivery(SM12)	2
MP09	Low Level Weapon Delivery(SM13)	2
MP10	Low Level Weapon Delivery(SM14)	2
MP11	Comprehensive Course Evaluation(SM15)	2
	TOTAL	21

6

EW -- Electronic Warfare		Hours
EW01	Introduction to Electronic Warfare (EW) in a Fighter Environment	1
EW02	EW System Operation	2
EW03	Radar Systems	3
EW04	Electro-Optical Principles	1
EW05	Signal Recognition	2
EW06	Eurasian Air Defense Systems I	5
EW07	Eurasian Air Defense Systems II	2
EW08	ALR-46(V)-2 Radar Warning Receiver (RWR)	1
EW09	ALQ-T5 RWR Lab	1
EW10	ALR-46 Radar Warning Receiver (RWR)	1
EW11	ALQ-T4 Radar Warning Receiver (RWR) Lab	1
EW12	Electronic Countermeasures (ECM) Principles and ECM Pods	4
EW13	Expendable Systems	2
EW14	Communications Jamming and MIJI	1
EW15	Electronic Warfare Penetration Problem	4
EW16	Examination	2
EW17	Critique	1
	TOTAL	34

7

		Hours
PI -- Processing and Indoctrination (15 Hours)		
PI01	Air Force Standards	1
PI02	Accident Investigation Proceedings	1
PI03	Commercial Transportation Briefing	1
PI04	Physical Examination	3
PI05	Chemical Warfare	1
PI06	Equipment Turn-In	1
PI07	End-of-Course Critique	1
PI08	Out Processing	2
PI09	Graduation Practice	2
PI10	Graduation	2
	TOTAL	15

SM -- Simulator Mission

MSN	TYPE	HOURS	DESCRIPTION
SM01	T4	2.0	Checklist and Emergency Procedure Practice
SM02	T4	2.0	Instrument Procedures
SM03	T4	2.0	Unusual Attitude Recoveries
SM04	T40	2.0	SIDs and Approach Training
SM05	T45	4.0	SIDs and Approach Training
SM06	T45	6.0*	Low Level Demonstration/Performance
SM07	T45	6.0*	Low Level (Full Profile)
SM08	T45	6.0*	Low Level (Full Profile)
SM09	T45	6.0*	Low Level (Full Profile)
SM10	T45	6.0*	Low Level (Full Profile w/Diversion)
SM11	T45	6.0*	Low Level Evaluation
SM12	T45	6.0*	Low Level Weapon Delivery Demo/ Performance
SM13	T45	6.0*	Low Level Weapon Delivery Demo/ Performance
SM14	T45	6.0*	Low Level Weapon Delivery Full Profile
SM15	T45	6.0*	Comprehensive Course Evaluation
	TOTAL	72	

*6 Hour Period Includes:

1 hr -- Mission Brief

4 hrs-- Mission

2 hrs-- Critique

FM -- Flight Mission

MSN	TYPE	FLT HRS	SUPPORT HRS*	DESCRIPTION
FM01	T-37	1.3	2.0	Instruments
FM02	T-37	1.3	2.0	Instruments
FM03	T-37	1.3	2.0	Instruments
FM04	T-37	1.3	2.0	Instrument Check
FM05	T-37	1.3	2.0	Contact (Stalls and Recoveries)
FM06	T-37	1.3	2.0	Contact (Unusual Attitudes)
FM07	T-37	1.3	2.0	Contact (Unusual Attitudes)
FM08	T-37	1.3	2.0	Formation
FM09	T-37	1.3	2.0	Formation
FM10	T-37	1.3	2.0	Formation
FM11	T-37	1.3	2.0	Phase Check (Contact, Form)
FM12	T-37	1.3	2.0	Low Level
FM13	T-37	1.3	2.0	Low Level
FM14	T-37	1.3	2.0	Low Level
FM15	T-37	1.3	2.0	Low Level
FM16	T-37	1.3	2.0	Low Level
FM17	T-37	2.6	2.0	Comprehensive Flight Check
TOTALS		23.4	34.0	

*Support hours consist of briefing and critique.

WSO Task Listing
(Mather Program)

WA0201 Determine Impact of Restrictions on Planning
- WA0201.01 Interpret Weather Flimsy
- WA0201.02 Analyze Charts, FLIP NOTAMS, and Supplements for Mission Limiting Factors
- WA0201.03 Identify Special Use Airspace and Altitudes

WA0301 Prepare Local Area Map

WA0302 Prepare AF Form 70
- WA0302.01 Compute and Record Fuel Consumption Data
- WA0302.02 Complete Route of Flight Column
- WA0302.03 Compute and Record Courses, Headings, and Distances
- WA0302.04 Compute and Record Leg and Total Times
- WA0302.05 Compute and Record IAS and GS
- WA0302.06 Record Alternate Airfield Data
- WA0302.07 Verify Accuracy and Completeness of Flight Log
- WA0302.08 Compute and Record TC and Log Performance Data
- WA0302.09 Compute and Record Wind Corrections

WA0303 Prepare DD Form 175

WA0304 Prepare DD Form 1801

WA0305 Prepare Weapons Delivery Segment of Mission
- WA0305.01 Check Adequacy and Currency of Weapons Delivery Documents
- WA0305.02 Determine Weapon Delivery Method (Primary and Backup)
  - WA0305.02a Analyze Target and Terrain Data
- WA0305.03 Determine Approach Parameters
  - WA0305.03a Determine Axes of Attack
  - WA0305.03b Determine Altitude
  - WA0305.03c Determine Airspeed
- WA0305.04 Compute Ballistics Data

WA0306 Prepare Low Level Charts
- WA0306.01 Determine Route
- WA0306.02 Plot and Label Check Points, Courselines, and Time Ticks
- WA0306.03 Plot Alternate Route
- WA0306.04 Select and Annotate Emergency Airfields
- WA0306.05 Annotate Restricted Areas
- WA0306.06 Locate and Annotate High Obstructions
- WA0306.07 Annotate Course Arrow Boxes
- WA0306.08 Verify Accuracy and Completeness of Chart

WA0306 Perform Mission Briefing

WA04 Assemble and Check Mission Equipment

WA0402 Assemble and Check Life Support Equipment
- WA0402.01 Determine Life Support Equipment Requirements
- WA0402.02 Check Helmet and Mask
- WA0402.03 Check Parachute
- WA0402.04 Check Survival Kit

WB01 Perform Preflight Check

WB02 Perform Exterior Inspection

WB03 Perform Interior Check

WB0404 Check Radio Equipment/IFF

WC01 Perform Interior Check

WC0202 Check Other Required Systems
- WC0202.01 Perform Bombing Equipment Calibration and Functional Checks
- WC0202.02 Check Circuit Breaker Panel
- WC0202.03 Monitor Flight Control Check
- WC0202.04 Check Flight Instruments

WD01 Assist in Engine Start

WD0101 Monitor Engine Start
- WD0101.01 Check Engine Instruments

WD03 Perform Taxi Operations

WD0301 Perform Taxiing Checklist

WD0302 Assist Pilot During Taxi
- WD0302.01 Monitor Taxi Progress
- WD0302.02 Clear
- WD0302.03 Monitor and Operate Communications Radios
- WD0302.04 Monitor Engine Instruments

WD0401 Perform Before Takeoff Checklist

- WD0402.02 Brief Takeoff Data
- WD0402.05 Check Aircraft Configuration
- WD0402.07 Review Abort Procedures

WE01 Perform Lineup Check

WE02 Monitor Takeoff

WE0301 Perform Climb Checks

WE0302 Perform Level Off Checks

WE0305 Operate Communication Radios and IFF

WE0309 Direct the Pilot to Perform Departure

WE0310 Monitor Aircraft Performance
- WE0310.01 Monitor Altitude
- WE0310.02 Monitor Airspeed
- WE0310.03 Monitor Aircraft Position

WE0311 Record Takeoff and Climb Data
- WE0311.01 Make Form 70 Entries

WF0101 Monitor Engine Instruments

WF0103 Monitor Flight Instruments
- WF0103.01 Monitor Warning Indicators
- WF0103.02 Check Heading Indicators

WF0201 Configure VOR, DME, and IFF

WF03 Determine and Confirm Aircraft Position

WF0301 Identify Landmark Update Point
- WF0301.01 Identify Landmark Location Visually
- WF0301.02 Identify Landmark Location Using Radar

WF0302 Use Visual Navigation Procedures
- WF0302.01 Use Pilotage Data

WF0303 Use Automatic Navigation Procedures
- WF0303.01 Read Wind Data Display
- WF0303.02 Read Data on Appropriate Display
- WF0303.03 Monitor Automatic Navigation System

WF0304 Use Mental DR Procedures
- WF0304.01 Determine Aircraft Position
- WF0304.02 Extract/Complete Log Entries

WF0305 Use DME
- WF0305.01 TIM
- WF0305.02 Read Range
- WF0305.03 Plot Position

WF0306 Use VOR
WF0306.01 TIM
WF0306.02 Read Bearing
WF0306.03 Plot LOP

WF0307 Use Enroute Chart Data
WF0307.01 Identify Planned Airways
WF0307.02 Determine Radio Aid Usage
WF0307.03 Identify Position Reporting Points

WF0308 Use IFF
WF0308.01 Configure IFF
WF0308.02 Communicate with Ground Radar

WF0309 Integrate Position Information from Multiple Sources
WF0309.01 Update Navigation Computer as Required

WF04 Perform Enroute Communications

WF0401 Operate Communication Radios

WF0402 Operate IFF

WF0403 Monitor Backup Frequencies

WF0404 Accomplish In-flight Position Report
WF0404.01 Prepare Position Report
WF0404.02 Transmit Position Report

WF05 Perform In-flight Fuel Management Procedures

WF0501 Perform In-flight Fuel Checks

WF0502 Determine if Fuel is Adequate for Mission Completion

WF0503 Alter Navigation Based on Calculations

WF06 Direct Aircraft Along Route

WF0601 Monitor Aircraft Position

WF0602 Communicate with Controlling Agency

WF07 Compute Allowances for Enroute Weather and Wind

WF0701 Monitor Weather Situation

WF0702 Direct Aircraft Along Weather Penetration Route

WF0703 Compensate for Wind Conditions Along Route
- WF0703.01 Compute ETAs
- WF0703.02 Determine Time Deviations
- WF0703.03 Apply Speed Correction
- WF0703.04 Determine Drift Correction to Maintain Desired Track

WF08 Compute and Use Changes Required to Maintain Track, Altitude, and Speed

WF0801 Use Manually Computed Headings

WF0802 Use Automatically Computed Headings

WF0803 Compute Required Altitude Changes

WF0804 Compute Timing Point Procedures

WF0805 Perform Orbiting Procedures

WF09 Determine Track and Groundspeed

WF0901 Extract Data From Equipment Displays
- WF0901.01 Extract Course, Bearing, and Radial from VOR
- WF0901.02 Use DME to Determine Groundspeed
- WF0901.03 Use Time to Determine Groundspeed

WF0902 Use Visual Navigation Methods
- WF0902.01 Use Pilotage Procedures

WF10 Perform Formation Procedures

WF1001 Perform Two-ship Formation Procedures

WF11 Perform Airwork

WF1101 Direct Basic Airwork

WF1102 Direct Advanced Airwork

WF1103 Perform Unusual Attitude Recoveries

WG Perform Low Level Procedures

WG01 Configure Aircraft for Descent and Low Level Segment of Mission

WG0101 Perform Before Descent and Descent Checks
WG0101.01 Configure Equipment for Low Level
WG0101.01a Configure RADAR
WG0101.02 Make Altitude Calls
WG0101.02a Call passing 10,000
WG0101.02b Call 1000 above
WG0101.02c Call 100' above
WG0101.03 Coordinate Altimeter check
WG0101.04 Monitor Systems and Engine Instruments

WG0102 Clear

WG0103 Monitor Terrain Avoidance

WG0104 Monitor Time and Course Control
WG0104.01 Plan and Direct Descent

WG02 Perform Communications Procedures

WG0201 Perform Communications
WG0201.01 Monitor Internal Communications
WG0201.01a Monitor Interphone
WG0201.02 Perform External Communications
WG0201.02a Use UHF Radio

WG0202 Monitor Terrain Avoidance
WG0202.01 Monitor Radar
WG0202.02 Perform Visual Search

WG03 Direct Aircraft Along Low Level Route

WG0301 Perform Visual Navigation Procedures
WG0301.01 Use Mental DR
WG0301.02 Identify Landmark
WG0301.03 Estimate Distances to Landmark
WG0301.04 Maintain Chart and Log Requirements

WG0302 Perform Search Radar Procedures
WG0302.01 Determine Approximate DR Position of Chart
WG0302.02 Identify Targets on Radar
WG0302.03 Determine Actual Position on Chart

WG0303 Perform Time and Course Control
WG0303.01 Determine if Ahead or Behind Time
WG0303.01a Determine Present Position
WG0303.02 Determine if Airspeed Change is Necessary
WG0303.04 Communicate Necessary Changes to Pilot
WG0303.05 Monitor Airspeed on Heading Adjustment

WG04 Configure Systems for Weapon Delivery

WG0401 Perform Required Checklists

WG0402 Configure Radar

WG0404 Configure Weapons Computer

WG0405 Perform Weapons Delivery Checklist

WG05 Direct Aircraft to Weapon Delivery Point

WG0501 Identify Time Reference Point
WG0501.01 Use Visual Means (VTRP)
WG0501.02 Use Radar (RTRP)

WG0502 Identify Weapon Delivery Offset
WG0502.01 Use Radar
WG0502.02 Use Weapon Computer(s)

WG0503 Perform Pre-Release Procedures
WG0503.01 Coordinate with Pilot
WG0503.01a Configure Delivery Parameters
WG0503.01b Select Weapons for Release
WG0503.01c Verify Readiness of Weapons
WG0503.02 Arm Weapons for Release

WG0504 Direct Weapon Delivery Approach
WG0504.01 Direct Aircraft to Release Point
WG0504.02 Coordinate Aircraft Parameters with Pilot
WG0504.03 Position Radar Crosshairs
WG0504.04 Perform Weapons Release with Pilot
WG0504.04a Coordinate Weapons Release with Pilot
WG0504.04b Monitor Post Release Recovery

WG06 Perform Post Release Procedures

WG0601 Reconfigure Equipment for High Altitude Mission
WG0601.01 Perform Arm and Safety Checklist
WG0601.02 Configure Radar
WG0601.03 Configure Computer(s)
WG0601.04 Configure Communication Radios

WH Perform Contingency Operations

WH01 Perform In-Flight Mission Replanning

WH0101 Replan to Avoid Adverse Weather

WH0102 Receive Change in Mission Objective

WH0103 Plan Route to Alternate Target/Launching Base Using Automatic Method

WH0104 Plan Route to Alternate Target/Launching Base Using Manual Method

WH02 Perform Equipment Malfunction Analysis

WH0201 Isolate Malfunction

WH0202 Replace Malfunctioning Unit

WH0203 Configure System for Alternate Modes of Operation

WH0204 Utilize Appropriate Manual Procedures

WI Perform Emergency Procedures

WI01 Perform Emergency In-flight Replanning

WI0101 Compute New Fuel Requirements

WI0102 Deactivate Required System(s)

WI0103 Request Assistance

WI0104 Assist Pilot with Aircraft Emergencies

WI0105 Determine Aircraft Position

WI0106 Direct Aircraft to Emergency Field

WI02 Perform Ejection Procedures

WI0201 Perform Pre-Ejection Procedures
WI0201.01 Prepare &/or Transmit Emergency message

WI0202 Perform Manual Bailout Procedures

WI0203 Perform Ejection Procedures

WI03 Perform Ground Egress Procedures

WJ02 Direct Holding Procedures

WJ0201 Direct Holding Entry.

WJ0202 Accomplish Timing Procedures

WJ0203 Perform Wind Corrections

WJ03 Direct Instrument Approach

WJ0301 Operate Navigation Systems

WJ0302 Monitor Aircraft Performance

WJ0303 Perform Safety Procedures

WJ0304 Review TERPS

WJ0305 Perform Communications (Except GCA)
WJ0305.01 Perform Mandatory Altitude Calls

WJ04 Direct VFR Patternsand Landings

WJ05 Perform Airborne Radar Approach
WJ0501 Configure Radar for ARA

WJ0502 Direct Aircraft Along Approach

WJ06 Perform Required Checklists

WJ0601 Perform Before Descent Checklist

WJ0602 Perform Approach to Field Checklist

WJ0603 Perform Before Landing Checklist

WJ0604 Perform Missed Approach Checklist

WJ07 Direct Aircraft to Alternate

WJ0701 Direct Aircraft Using Preplanned Information

WJ0702 Direct Aircraft Using In-Flight Information

WJ0703 Direct Missed Approach Procedures

WJ08 Assist Pilot in Transition to Landing

WJ0801 Use VASI/Visual Aids

WJ0802 Monitor Landing

WJ0803 Perform Rollout Procedures

WK Perform Post Mission Taxi and Shutdown

WK01 Assist Pilot in Taxi Operations

WK0101 Perform After Landing Checklist

WK0102 Clear

WK0103 Operate Communication Radios

WK02 Deactivate Aircraft Systems

WK0201 Perform Engine Shutdown Checklist

WK03 Perform Post Shutdown Procedures

WK0301 Perform Before Leaving Aircraft Position

WK0302 Safety Ejection Seat

WK0303 Inspect General Aircraft Exterior

WL Perform Post Mission Duties

WL01 Record Data in Records, Forms, and Booklets

WL0101 Complete AFTO Form 781

WL02 Turn in Personal Equipment

WL03 Complete Crew Debriefing

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